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(54) **LETTUCE VARIETY NUN 09051 LTL**

(71) Applicant: **Nunhems B.V.**, AC Nunhem (NL)

(72) Inventor: **Johan van Zee**, Zaltbommel (NL)

(73) Assignee: **Nunhems, B.V.**, AC Nunhem (NL)

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CPC **A01H 5/12** (2013.01)

(58) **Field of Classification Search**

None

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

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* cited by examiner

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(57) **ABSTRACT**

The present invention relates to plants of a lettuce variety NUN 09051 LTL and, seeds and progeny thereof. The invention further relates to methods for producing a lettuce plant by traditional breeding methods. Moreover, the invention relates to a method for producing a lettuce plant containing in its genetic material one or more transgenes.

26 Claims, 2 Drawing Sheets

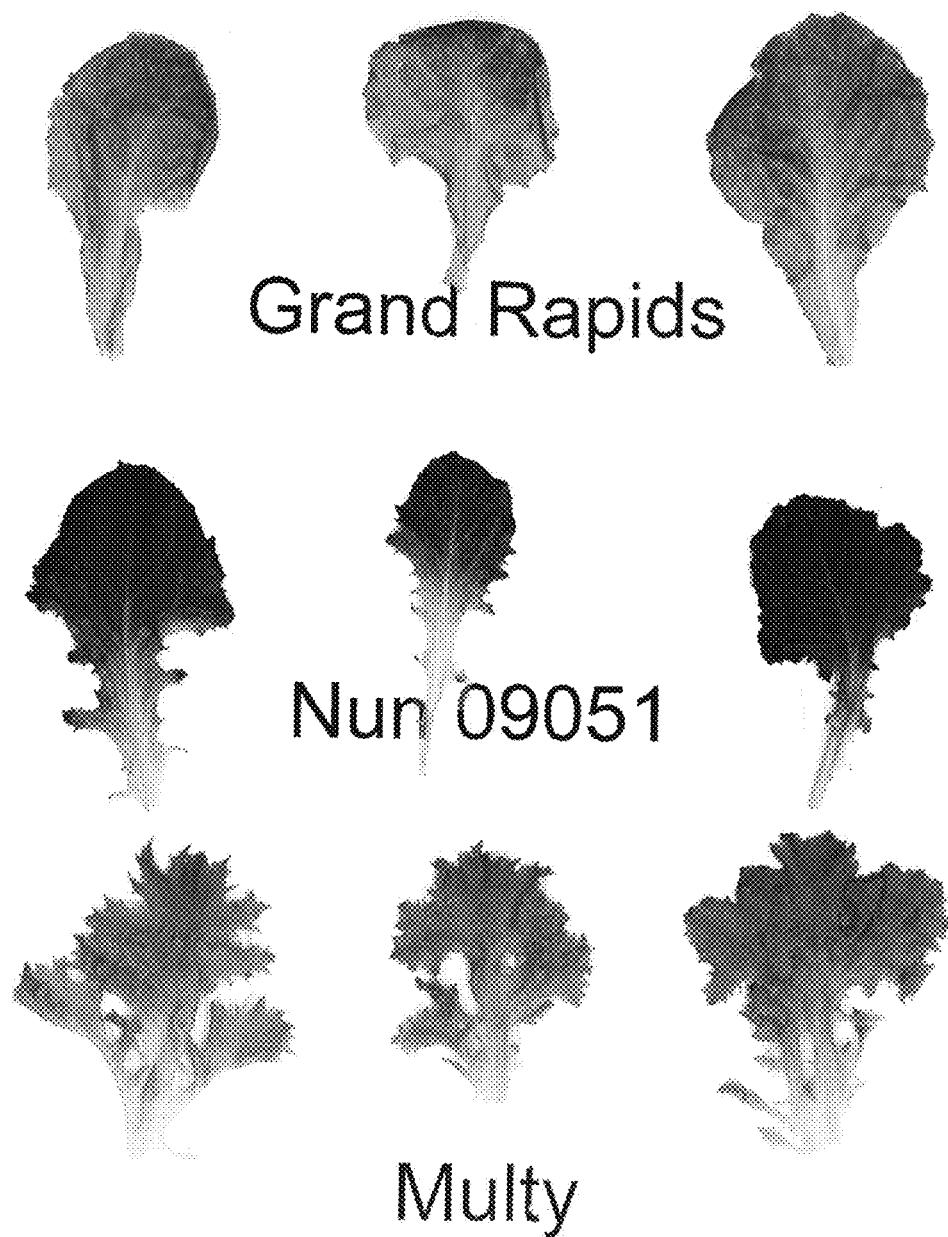


FIG. 1

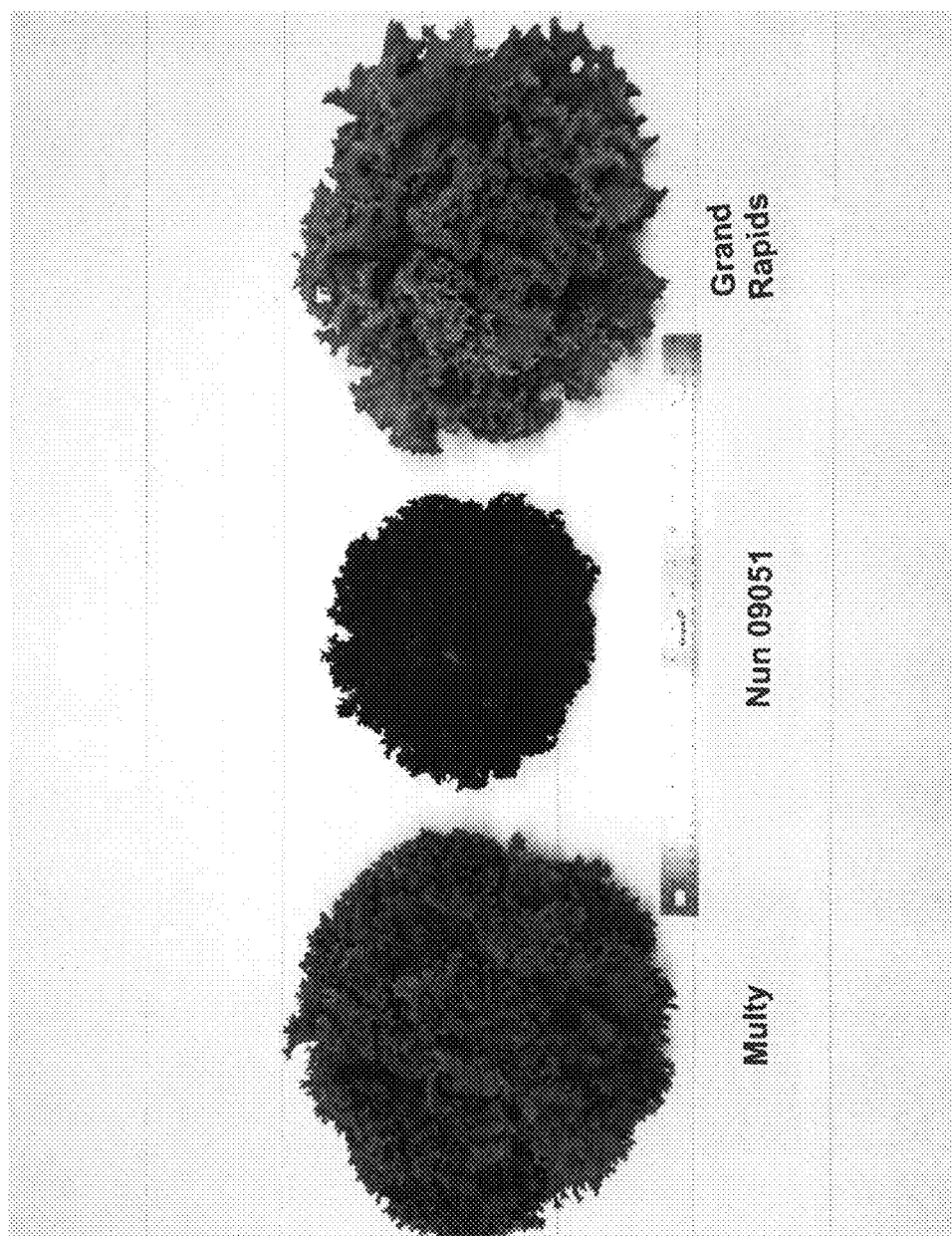


FIG. 2

LETTUCE VARIETY NUN 09051 LTL

FIELD OF THE INVENTION

The present invention relates to the field of plant breeding. In particular, the invention provides for a new and distinct variety of lettuce designated NUN 09051 LTL (or "NUN 09051" or "09051").

All cultivated forms of lettuce belong to the highly polymorphic species *Lactuca sativa* that is grown for its edible head and leaves. *Lactuca sativa* is in the Cichoreae tribe of the Asteraceae (Compositae) family. Lettuce is related to chicory, sunflower, aster, dandelion, artichoke and chrysanthemum. *L. sativa* is one of about 300 species in the genus *Lactuca*.

Fresh lettuce is available in the United States year-round although the greatest supply is from May through October. For planting purposes, the lettuce season is typically divided into three categories, early, mid and late, with the coastal areas planting from January to August, and the desert regions planting from August to December. Fresh lettuce is consumed nearly exclusively as fresh, raw product and occasionally as a cooked vegetable.

The development of commercial lettuce cultivars requires the development of lettuce varieties, the crossing of these varieties, and the evaluation of the crosses. Pedigree breeding and recurrent selection breeding methods are used to develop cultivars from breeding populations. Breeding programs combine desirable traits from two or more varieties or various broad-based sources into breeding pools from which cultivars are developed by selfing and selection of desired phenotypes. The new cultivars are crossed with other varieties and the hybrids from these crosses are evaluated to determine which have commercial potential.

Lifestyles change and the demand from restaurants and catering firms for colorful and interesting garnish for sandwiches and ready-to-use processed salads continue to rise. As a result, there is a demand for breeding companies to develop new varieties with specific shapes of leaves, specific average size of leaves, prominent color and a wide variety of texture, as well as good yield.

SUMMARY OF THE INVENTION

The invention provides for a new Cutting/Leaf lettuce variety designated NUN 09051, representative seed of said variety having been deposited under Accession Number NCIMB 42446, and plant parts of the new variety such as (harvested) leaves, or parts of the leaves. Non-limiting examples for parts of said plant are microspore, pollen, ovary, ovule, flower, stalk, leaf, head, shoot, shoot tip, seed, embryo, embryo sac, cutting, root, root tip, pistil, anther, cotyledon, hypocotyl, meristematic cell, stem, cell, in vitro cell cultures or tissue cultures, protoplast, meristem, fruit, petiole, bud or parts of any of these such as parts of leaves. In some embodiments, parts of a lettuce plant designated NUN 09051 are provided which are suitable for sexual reproduction or vegetative reproduction, or a tissue culture or cell culture of a lettuce plant designated NUN 09051 is provided.

The invention also provides for seeds of lettuce plant designated NUN 09051, representative seed of said variety having been deposited under Accession Number NCIMB 42446, plant, or a part thereof (such as a lettuce head or leaves), produced by growing said seed.

In a further aspect, the invention provides a plant which is regenerated from a part of the lettuce plant designated

NUN 09051 that is suitable for vegetative reproduction or a plant which is regenerated from a cell or tissue culture of a plant designated NUN 09051.

Also provided are one or more progeny plants (offspring or descendants) of a lettuce plant designated NUN 09051 obtained by further breeding with said variety designated NUN 09051. Said progeny plant(s) has/have essentially all physiological and morphological characteristics of variety NUN 09051 when grown under the same environmental conditions. In one embodiment, said progeny plant(s) has/have a white (silver grey) seed color (see USDA criteria); a pinnately lobed shape of fourth leaf (see USDA criteria); a coarsely dentate apical margin of fourth leaf (see USDA criteria); a coarsely dentate basal margin of fourth leaf (see USDA criteria); a distribution of anthocyanin through the fourth leaf excluding the petiole/rib (see USDA criteria); an intense concentration of anthocyanin in the fourth leaf (see USDA criteria); a lack of pure green color in the mature leaves, i.e. RHS Purple Group N77A (see USDA criteria); a throughout distribution of anthocyanin in the mature leaves (see USDA criteria); an intense concentration of anthocyanin in the mature leaves (see USDA criteria); a small head size class (see USDA criteria); a head weight that is at least about 100 g lighter, or even about 125 g, 150 g, 160 g, 170 g, 175 g, 180 g, 185 g, 190 g, 195 g, or even about 195.2 g lighter than the head weight of MULTY (see USDA criteria); a head weight that is at least about 250 g lighter, or even about 275 g, 300 g, 325 g, 350 g, 375 g, 400 g, 410 g, 420 g, 430 g, 440 g, 450 g, 460 g, 470 g, or even about 471.6 g lighter than the head weight of GRAND RAPIDS (see USDA criteria); a core diameter at base of head that is at least about 40% smaller, or even about 45%, 50%, 55%, 60%, 62%, 64%, 65%, 66%, 67%, or even about 67.7% smaller than the core diameter at base of head of MULTY (see USDA criteria); a core diameter at base of head that is at least about 50% smaller, or even about 60%, 65%, 66%, 67%, 68%, 69%, 70%, or even about 70.4% smaller than the core diameter at base of head of GRAND RAPIDS (see USDA criteria); a core height from base of head to apex that is at least about 25%, 30%, 35%, 40%, 41%, 42%, 43%, 44%, 45%, 46%, 47%, or even about 47.9% smaller than the core height from base of head to apex of MULTY (see USDA criteria); a core height from base of head to apex that is at least about 45% smaller, or even about 50%, 55%, 56%, 57%, 58%, 59%, 60%, or even about 61% smaller than the core diameter at base of head of GRAND RAPIDS (see USDA criteria); a very slow bolting class (see USDA criteria).

Moreover, also an Essentially Derived Variety (EDV) of a lettuce plant designated NUN 09051 is provided, e.g., an Essentially Derived Variety of NUN 09051 having one or two physiological and/or morphological characteristics which are different from those of NUN 09051 and which otherwise has essentially all physiological and morphological characteristics when grown under the same environmental conditions of a lettuce plant designated NUN 09051 obtainable by selecting a natural or induced mutant, or a somaclonal variant from a population of plants designated NUN 09051.

In another aspect the invention refers to packages, e.g., a container, a bag and the like, comprising at least one of the following: seeds or seed pellets of lettuce variety designated NUN 09051, lettuce plant(s) designated NUN 09051, parts thereof (e.g. heads or loose leaves), progeny of a lettuce plant designated NUN 09051, parts thereof, EDV of a plant designated NUN 09051 or parts thereof.

Also provided is a food or feed product comprising at least a part of a lettuce plant designated NUN 09051, progeny thereof or a EDV thereof.

In further aspects, the invention provides methods of producing a lettuce plant, comprising crossing a lettuce plant designated NUN 09051 with a second lettuce plant one or more times and/or selfing the lettuce plant designated NUN 09051 one or more times, and selecting progeny from said crossing and/or selfing.

Also provided is a method of producing a lettuce plant derived from NUN 09051 comprising the steps of:

- (a) preparing a progeny plant derived from NUN 09051 by crossing the plant designated NUN 09051 with itself or with a second lettuce plant;
- (b) crossing the progeny plant with itself or a second lettuce plant to produce a seed of a progeny plant of a subsequent generation; and optionally
- (c) growing a progeny plant of a subsequent generation from said seed and crossing the progeny plant of a subsequent generation with itself or a second lettuce plant; and optionally
- (d) repeating step b) and/or c) for at least one more generation to produce a lettuce plant derived from NUN 09051.

As mentioned herein, a “second lettuce plant” refers to any lettuce plant not being NUN 09051. Reference to a “second lettuce plant” as in method steps (a), (b), and (c) may refer to different plants, i.e. different lettuce plants being used in step (a), and/or (b), and/or (c).

In another aspect the invention provides a method of producing a hybrid lettuce seed comprising crossing a first parent lettuce plant with a second parent lettuce plant and harvesting the resultant hybrid lettuce seed, wherein said first parent lettuce plant or said second parent lettuce plant is a lettuce plant designated NUN 09051.

Also provided is hybrid lettuce seed (from which a hybrid plant can be grown) produced from crossing a first parent lettuce plant with a second parent lettuce plant and harvesting the resultant hybrid lettuce seed, wherein said first parent lettuce plant or said second parent lettuce plant is a plant designated NUN 09051. Moreover, also provided are hybrid lettuce plants which are grown from a hybrid lettuce seed whereof one parent is a plant designated NUN 09051.

In another aspect the invention provides a method of introducing a single locus conversion into a plant designated NUN 09051, representative seed of which having been deposited under Accession Number NCIMB 42446, comprising

- (a) crossing a plant designated NUN 09051 with a second plant comprising a desired single locus to produce an F₁ progeny plant;
- (b) optionally selfing said F₁ progeny plant to produce an F₂ progeny plant having said single locus;
- (c) optionally crossing said F₁ or F₂ progeny plant of step (a) or step (b), respectively, with a plant of NUN 09051, representative seed of which having been deposited under Accession Number NCIMB 42446, to produce backcross progeny plants;
- (d) optionally selecting backcross progeny plants that have the single locus and otherwise essentially all physiological and morphological characteristics when grown under the same environmental conditions of a plant designated NUN 09051; and
- (e) optionally repeating steps (c) and (d) one or more times in succession to produce selected second or higher backcross progeny plants that comprise the single locus and otherwise comprise essentially all

physiological and morphological characteristics when grown under the same environmental conditions of a plant designated NUN 09051.

In one embodiment, said single locus confers a trait, wherein the trait is pest resistance or disease resistance such as resistance against *Nasonovia ribisnigri* NR:0 or resistance against *Nasonovia ribisnigri* NR:1. Further pest or disease resistances are, e.g., resistance against downy mildew, e.g., at least one race selected from the group consisting of races B1:1 to 28 and other known *Bremia lactucae* races, *Sclerotinia* rot, *Botrytis*, powdery mildew, anthracnose, bottom rot, corky root rot, lettuce mosaic virus, big vein, lettuce aphid, beet western yellows and aster yellows, *Sclerotinia minor* (leaf drop), *Sclerotinia sclerotiorum* (leaf drop), *Rhizoctonia solani* (bottom drop), *Erysiphe cichoracearum* (powdery mildew), *Fusarium oxysporum* f. sp. *lactucae* (*Fusarium* wilt), lettuce infectious yellows virus (LIYV), lettuce mosaic virus (LMV), Cucumber mosaic virus (CMV), Beet western yellows virus (BWYV), and Alfalfa mosaic virus (AMV).

In another embodiment the trait conferred by said single locus is another trait, such as a morphological or physiological trait, herbicide resistance, stress tolerance or stress resistance (e.g. drought tolerance), enhanced yield, etc.

A further aspect of the invention relates to a method of producing transgenic progeny of a plant designated NUN 09051 wherein said progeny has at least the essential physiological and morphological characteristics when grown under the same environmental conditions of the variety designated NUN 09051 and further comprises a desired trait, said method comprising transforming a NUN 09051 plant with at least one transgene that confers said desired trait or crossing a plant designated NUN 09051 with a lettuce plant comprising said desired trait so that the genetic material of the progeny that results from the cross contains the transgene(s). Moreover, also transgenic plants produced by this method are provided herewith.

FIGURE

FIG. 1, shows the differences in shade and shape of a typical fourth leaves of NUN 09051, MULTY and GRAND RAPIDS.

FIG. 2, shows the differences in shade and shape of the mature head of NUN 09051, MULTY and GRAND RAPIDS.

GENERAL DEFINITIONS

All patent and non-patent literatures cited herein are incorporated by reference in their entireties.

“Lettuce” refers herein to plants of the species *Lactuca sativa* L.

The terms “NUN 09051 LT”, “lettuce plant designated NUN 09051”, “NUN 09051”, or “variety designated NUN 09051” refer to a lettuce plant/variety of lettuce, representative seed of which having been deposited under Accession Number NCIMB 42446.

“USDA descriptors” are the plant variety descriptors described for lettuce in the “Objective description of Variety Lettuce (*Lactuca sativa* L.)”, ST-470-1 (dated Jul. 1, 2009) as published by U.S. Department of Agriculture, Agricultural Marketing Service, Science and Technology, Plant Variety Protection Office, Beltsville, Md. 20705 (available on the world wide web at www.ams.usda.gov/AMSv1.0/) and which can be downloaded from the world wide web at

www.ams.usda.gov/AMSV1.0/
getfile?dDocName=stelpdrc5069208.

“UPOV descriptors” are the plant variety descriptors described for lettuce in the “Guidelines for the Conduct of Tests for Distinctness, Uniformity and Stability,” TG/013/10 (Geneva 2006), as published by UPOV (International Union for the Protection of New Varieties and Plants, available on the world wide web at upov.int) upov.int/en/publications/tg_rom/tg_index.html. Likewise, “UPOV methods” to determine specific parameters for the characterization of lettuce are described at upov.int.

“RHS” refers to the Royal Horticultural Society of England which publishes an official botanical color chart quantitatively identifying colors according to a defined numbering system. The chart may be purchased from Royal Horticulture Society Enterprise Ltd RHS Garden; Wisley, Woking; Surrey GU236QB, UK, e.g., the RHS colour chart: 2007 (The Royal Horticultural Society, charity No: 222879, PO Box 313 London SW1P2PE; sold by, e.g., TORSO-VERLAG, Obere Gröben 8•D-97877 Wertheim, Article-No.: Art62-00008 EAN-Nr.: 4250193402112).

As used herein, the term “plant” includes the whole plant or any parts such as plant organs (e.g., harvested or non-harvested leaves, etc.), plant cells, plant protoplasts, plant cell or tissue cultures from which whole plants can be regenerated, plant callus, plant cell clumps, plant transplants, seedlings, plant cells that are intact in plants, plant clones or micro propagations, or parts of plants (e.g., harvested tissues or organs), such as plant cuttings, vegetative propagations, embryos, pollen, ovules, flowers, leaves, heads, seeds, clonally propagated plants, roots, stems, stalks, root tips, grafts, parts of any of these and the like, or derivatives thereof, preferably having the same genetic make-up (or very similar genetic make-up) as the plant from which it is obtained. Also any developmental stage is included, such as seedlings, cuttings prior or after rooting, mature and/or immature plants or mature and/or immature leaves.

“Cotyledon” refers to one of the first leaves of the embryo of a seed plant; typically one or more in monocotyledons, two in dicotyledons and two or more in gymnosperms.

“Tissue Culture” refers to a composition comprising isolated cells of the same or a different type or a collection of such cells organized into parts of a plant. Tissue culture of various tissues of lettuce and regeneration of plants therefrom is well known and widely published (see, e.g., Teng et al., HortScience. 1992, 27(9): 1030-1032 Teng et al., HortScience. 1993, 28(6): 669-1671, Zhang et al., Journal of Genetics and Breeding. 1992, 46(3): 287-290).

“Harvested plant material” refers herein to plant parts (e.g., leaves detached from the whole plant) which have been collected for further storage and/or further use.

“Harvested seeds” refers to seeds harvested from a line or variety, e.g., produced after self-fertilization or cross-fertilization and collected.

“Head” as used herein refers to lettuce heads, i.e., the plant without the root system, for example substantially all harvested leaves (although this variety is a “loose-leaf” type). Encompassed are immature leaves (e.g. “baby leaf”) and mature leaves.

The “base” of a plant is the part of a lettuce plant where the leaves are attached to the root system of the plant.

“Core length” of the internal lettuce stem is measured from the base of the cut and trimmed head to the tip of the stem.

“Head weight” refers to the mean weight of saleable lettuce head, cut and trimmed to market specifications.

“Head diameter” refers to the mean diameter of the cut and trimmed head, sliced vertically, and measured at the widest point perpendicular to the stem.

“Head height” refers to the mean height of the cut and trimmed head, sliced vertically, and measured from the base of the cut stem to the leaf tip.

“Core Length to Head Diameter Ratio (CLHD Ratio)” refers to the mean core length/head diameter ratio. It is calculated by dividing the mean core length with the mean head diameter. This is an indication of the head shape and of the ability of a lettuce plant to reduce the amount of surface which is on or close to the ground.

“Ground” refers to the surrounding of the aerial tissues of a lettuce plant in which it is grown, or which is placed on the growing medium (e.g. a foil covering the growing medium such as soil but which does not cover the aerial plant, e.g., there is a hole in the foil through which the lettuce plant is growing).

A plant having “essentially all the physiological and morphological characteristics” means a plant having the physiological and morphological characteristics as listed in Table 1 when grown under the same environmental conditions of the plant from which it was derived, e.g. the progenitor plant, the parent, the recurrent parent, the plant used for tissue- or cell culture, etc., except for the characteristic(s) derived from a converted or introduced gene or trait. A plant having “essentially all the physiological and morphological characteristics of NUN 09051, except one, two, three, four or five characteristics” means that the lettuce plant, when grown under the same environmental conditions, significantly differs from NUN 09051 in 1, 2, 3, 4 or 5 characteristics listed in Table 1, but does not differ significantly in the other morphological and/or physiological characteristics of NUN 09051 listed in Table 1.

“Distinguishing characteristics” or “distinguishing morphological and/or physiological characteristics” refers herein the characteristics which are distinguishing between NUN 09051 and other lettuce varieties, such as Multy and/or Grand Rapids, when grown under the same environmental conditions, especially the following characteristics: 1) color of mature leaves; 2) distribution and concentration of anthocyanin in the mature leaves; 3) head size; 4) head weight; 5) core diameter at base of head. In one aspect the distinguishing characteristics further include at least one, two, three or more (or all) of the characteristics listed in Table 1. Thus, a lettuce plant “comprising the distinguishing characteristics of NUN 09051”, refers herein to a lettuce plant which does not differ significantly from NUN 09051 in characteristics 1) to 5) above. In a further aspect the lettuce plant further does not differ significantly from NUN 09051 in at least one, two, three, four, five or six characteristics selected from the characteristics listed in Table 1.

As used herein, the term “variety” or “cultivar” means a plant grouping within a single botanical taxon of the lowest known rank, which grouping, irrespective of whether the conditions for the grant of a breeder’s right are fully met, can be defined by the expression of the characteristics resulting from a given genotype or combination of genotypes, distinguished from any other plant grouping by the expression of at least one of the said characteristics and considered as a unit with regard to its suitability for being propagated unchanged.

“Progeny” as used herein refers to plants derived from a plant designated NUN 09051. Progeny may be derived by regeneration of cell culture or tissue culture or parts of a plant designated NUN 09051 or selfing of a plant designated NUN 09051 or by producing seeds of a plant designated

NUN 09051. In further embodiments, progeny may also encompass plants derived from crossing of at least one plant designated NUN 09051 with another lettuce plant of the same or another variety or (breeding) line, or wild *Lactuca* plants, backcrossing, inserting of a locus into a plant or mutation. A progeny is, e.g., a first generation progeny, i.e. the progeny is directly derived from, obtained from, obtainable from or derivable from the parent plant by, e.g., traditional breeding methods (selfing and/or crossing) or regeneration. However, the term “progeny” generally encompasses further generations such as second, third fourth, fifth, sixth, seventh or more generations, i.e., generations of plants which are derived from, obtained from, obtainable from or derivable from the former generation by, e.g., traditional breeding methods, regeneration or genetic transformation techniques. For example, a second generation progeny can be produced from a first generation progeny by any of the methods mentioned above.

A progeny plant may comprise the distinguishing characteristics of NUN 09051 and/or have essentially all physiological and morphological characteristics of the variety designated NUN 09051 when grown under the same environmental conditions.

An “Essentially Derived Variety” (EDV) shall be deemed to be essentially derived from another variety, “the initial variety”, under the following circumstances: (i) it is predominantly derived from the initial variety, or from a variety that is itself predominantly derived from the initial variety, while retaining the expression of essentially all characteristics that result from the genotype or combination of genotypes of the initial variety; and (ii) it is clearly distinguishable from the initial variety (e.g., one, one or more, two, two or more, three, three or more characteristics are different from the initial variety); and (iii) except for the differences which result from the act of derivation, it conforms to the initial variety in the expression of the essential characteristics that result from the genotype or combination of genotypes of the initial variety. Thus, an EDV may be obtained for example by the selection of a natural or induced mutant, or of a somaclonal variant, the selection of a variant individual from plants of the initial variety, backcrossing, or transformation by genetic engineering. Such a variant may be selected at any time, e.g. in the field or greenhouse, during breeding, during or after in vitro culture of cells or tissues, during regeneration of plants, etc.

“Plant line” is for example a breeding line which can be used to develop one or more varieties.

“Hybrid” refers to the seeds harvested from crossing one plant line or variety with another plant line or variety.

“F₁ hybrid” refers to the first generation progeny of the cross of two nonisogenic plants.

“Crossing” refers to the mating of two parent plants. Equally “Cross-pollination” refers to fertilization by the union of two gametes from different plants.

“Backcrossing” refers to a process in which a breeder repeatedly crosses hybrid progeny, for example a first generation hybrid (F₁), back to one of the parents of the hybrid progeny. Backcrossing can be used to introduce one or more single locus conversions from one genetic background into another. The terms “gene converted” or “conversion plant” in this context refer to plants which are developed by backcrossing wherein essentially all of the desired morphological and physiological characteristics of an inbred are recovered in addition to the one or more genes transferred into the inbred via the backcrossing technique or via genetic engineering.

“Regeneration” refers to the development of a plant from cell culture or tissue culture or vegetative propagation.

“Vegetative propagation”, “vegetative reproduction” or “clonal propagation” are used interchangeably herein and mean the method of taking part of a plant and allowing that plant part to form at least roots where plant part is, e.g., defined as or derived from (e.g. by cutting of) leaf, pollen, embryo, cotyledon, hypocotyl, cells, protoplasts, meristematic cell, root, root tip, pistil, anther, flower, shoot tip, shoot, stem, fruit, and petiole. When a whole plant is regenerated by vegetative propagation, it is also referred to as a vegetative propagation.

“Selling” refers to self-pollination of a plant, i.e., the transfer of pollen from the anther to the stigma of the same plant.

“Single Locus Converted (Conversion) Plant” refers to plants which are developed by plant breeding techniques comprising or consisting of backcrossing, wherein essentially all of the desired morphological and physiological characteristics of a lettuce variety are recovered in addition to the characteristics of the single locus having been transferred into the variety via the backcrossing technique and/or by genetic transformation.

“Transgene” or “chimeric gene” refers to a genetic locus comprising a DNA sequence which has been introduced into the genome of a lettuce plant by transformation. A plant comprising a transgene stably integrated into its genome is referred to as “transgenic plant”.

“Substantially equivalent” refers to a characteristic that, when compared, does not show a statistically significant difference (e.g., $p=0.05$) from the mean.

“Average” refers herein to the arithmetic mean.

“First water date” refers to the date the seed first receives adequate moisture to germinate. This can and often does equal the planting date.

“Maturity date” refers to the stage when the plants are of full size or optimum weight, in marketable form or shape to be of commercial or economic value. This is also the time point when measuring parameters of “mature” leaves.

The term “mean” refers to the arithmetic mean of several measurements. The skilled person understands that the appearance of a plant depends to some extent on the growing conditions of said plant. Thus, the skilled person will know typical growing conditions for lettuce of the types described herein. The mean, if not indicated otherwise within this application, refers to the arithmetic mean of measurements on at least 10 different, randomly selected plants of a variety at a required developing stage (e.g., fourth leaf or mature).

DETAILED DESCRIPTION

The present invention provides a new type of lettuce (*Lactuca sativa*) variety, designated NUN 09051. Lettuce variety designated NUN 09051 is of the Cutting/Leaf Type (USDA criteria). The objective of the cross was to develop a Cutting/Leaf variety with a prominent shape of its purple/red mature leaves.

Variety NUN 09051 is most similar to the commercially available variety MULTY. However, NUN 09051 differs from MULTY in one or more, e.g., at least two, at least three, optionally all morphological and/or physiological characteristics listed in the following (see also Table 1), when grown under the same environmental conditions:

the color of seeds of NUN 09051 is white (silver grey), whereas the color of MULTY is a mix of white (silver grey) seeds and black (grey brown) seeds (see USDA criteria);

the length/width index of fourth leaf: (L/W×10) of NUN 09051 is at least about 75% higher, or even about 80%, 85%, 90%, 91%, 92%, 93% or even about 93.1% higher than the length/width index of fourth leaf of MULTY (see USDA criteria);

the anthocyanin distribution in the fourth leaf of NUN 09051 is throughout the leaf excluding the petiole and/or rib, whereas the anthocyanin distribution in the fourth leaf of MULTY is absent (see USDA criteria);

the anthocyanin concentration in the fourth leaf of NUN 09051 is intense, whereas the anthocyanin concentration in the fourth leaf of MULTY is absent (see USDA criteria);

the mature leaves of NUN 09051 lack any pure green color, instead they have a purple color i.e. RHS Purple Group N77A, whereas the mature leaves of MULTY are dark green, i.e. RHS Green Group 138A (see USDA criteria);

the anthocyanin distribution in mature leaves of NUN 09051 is throughout, whereas the anthocyanin distribution in mature leaves of most similar variety MULTY is absent (see USDA criteria);

the anthocyanin concentration in mature leaves of NUN 09051 is intense, while the anthocyanin concentration in mature leaves of MULTY is absent (see USDA criteria);

the spread of frame leaves of NUN 09051 is at least about 25% smaller, or even about 30%, 32%, 34%, 36%, 38%, 39%, 40%, 41% or even about 41.4% smaller than the spread of frame leaves of MULTY (see USDA criteria);

the head weight of NUN 09051 is at least about 125 g lighter, or even about 150 g, 160 g, 170 g, 175 g, 180 g, 185 g, 190 g, 195 g, or even about 195.2 g lighter than the head weight of MULTY (see USDA criteria);

the core diameter at base of head of NUN 09051 is at least about 40% smaller, or even about 45%, 50%, 55%, 60%, 62%, 64%, 65%, 66%, 67%, or even about 67.7% smaller than the core diameter at base of head of MULTY (see USDA criteria);

the ratio of spread of frame leaves/core diameter of NUN 09051 is at least about 55% bigger, or even about 60%, 65%, 70%, 72%, 74%, 75%, 76%, 77%, 78%, or even about 78.9% bigger than the ratio of head/core diameter of MULTY (see USDA criteria);

the core height from base of head to apex of NUN 09051 is at least about 25%, 30%, 35%, 40%, 41%, 42%, 43%, 44%, 45%, 46%, 47%, or even about 47.9% smaller than the core height from base of head to apex of MULTY (see USDA criteria);

the bolting class of NUN 09051 is very slow, whereas the bolting class of MULTY is medium (see USDA criteria);

the height of mature seed stalk of NUN 09051 is at least about 40% smaller, or even about 45%, 46%, 47%, 48%, 49%, 50%, 51%, 52%, 53%, or even about 53.6% smaller than the height of mature seed stalk of MULTY (see USDA criteria);

the apical margin of fourth leaf of NUN 09051 is coarsely dentate, while the apical margin of fourth leaf of MULTY is incised (see USDA criteria);

the basal margin of fourth leaf of NUN 09051 is coarsely dentate, while the basal margin of fourth leaf of MULTY is incised (see USDA criteria);

the undulation of fourth leaf of NUN 09051 is slight, whereas the undulation of fourth leaf of MULTY is medium (see USDA criteria);

the green color of fourth leaf of NUN 09051 is light green, whereas the green color of fourth leaf of MULTY is medium green (see USDA criteria);

the head size class of NUN 09051 is small, whereas the head size class of MULTY is medium (see USDA criteria);

the spread of bolter plant (at widest point) of NUN 09051 is at least about 9% bigger, or even about 9.5%, 10%, 10.5%, 11%, 11.5%, 12%, 12.5%, 13%, 13.5%, 14% or even about 14.2% bigger than the spread of bolter plant (at widest point) of MULTY (see USDA criteria);

the color of bolter leaves of NUN 09051 is purple, whereas the color of bolter leaves of most similar variety MULTY is dark green (see USDA criteria);

concerning the bolting habit of NUN 09051, it has an absence of lateral shoots, whereas the bolting habit of MULTY shows a presence of lateral shoots (see USDA criteria);

concerning the bolting habit of NUN 09051, it has an absence of basal side shoots, whereas the bolting habit of MULTY shows a presence of lateral shoots (see USDA criteria). Comparing variety NUN 09051 with Standard Regional Check Variety GRAND RAPIDS reveals one or more, e.g., at least two, at least three, optionally all morphological and/or physiological characteristics listed in the following (see also Table 1), when grown under the same environmental conditions:

the color of seeds of NUN 09051 is white (silver grey), whereas the color of GRAND RAPIDS is a mix of white (silver grey) seeds and black (grey brown) seeds (see USDA criteria);

the shape of fourth leaf of NUN 09051 is pinnately lobed, whereas the shape of fourth leaf of GRAND RAPIDS is oval (see USDA criteria);

The length/width index of fourth leaf (L/W×10) of NUN 09051 is at least about 35% higher, or even about 40%, 45%, 46%, 47%, 48%, 49%, 50%, 51%, 52%, or even about 52.7% higher than the length/width index of fourth leaf of GRAND RAPIDS (see USDA criteria);

The apical margin of NUN 09051 is coarsely dentate, whereas the apical margin of GRAND RAPIDS is entire (see USDA criteria);

The anthocyanin distribution in the fourth leaf of NUN 09051 is throughout the leaf excluding the petiole and/or rib, whereas the anthocyanin distribution of GRAND RAPIDS is absent (see USDA criteria);

The anthocyanin concentration in the fourth leaf of NUN 09051 is intense, whereas the anthocyanin distribution of GRAND RAPIDS is absent (see USDA criteria);

The mature leaves of NUN 09051 lack any pure green color, i.e. RHS Purple Group N77A, whereas the mature leaves of GRAND RAPIDS have a light green color, i.e. RHS Yellow Green Group 144A (see USDA criteria);

The anthocyanin distribution in the mature leaves of NUN 09051 is throughout, whereas the anthocyanin distribution in the mature leaves of GRAND RAPIDS is absent (see USDA criteria);

The anthocyanin concentration in the mature leaves of NUN 09051 is intense, whereas the anthocyanin concentration in the mature leaves of GRAND RAPIDS is absent (see USDA criteria);

The spread of frame leaves of NUN 09051 is at least about 35% smaller, or even about 40%, 42%, 44%, 45%, 46%, 47%, 48%, 49%, 50%, 51%, 52%, or even about 52.8% smaller than the spread of frame leaves of GRAND RAPIDS (see USDA criteria);

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The head size class of NUN 09051 is small, whereas the head size class of GRAND RAPIDS is large (see USDA criteria);

The head weight of NUN 09051 is at least about 250 g lighter, or even about 275 g, 300 g, 325 g, 350 g, 375 g, 400 g, 410 g, 420 g, 430 g, 440 g, 450 g, 460 g, 470 g, or even about 471.6 g lighter than the head weight of GRAND RAPIDS (see USDA criteria); i.e. about 47% lighter, or even about 52%, 56%, 61%, 66%, 70%, 77%, 79%, 81%, 83%, 86%, 88% or even about 88.6% lighter than the head weight of GRAND RAPIDS (see USDA criteria);

The core diameter at base of head of NUN 09051 is at least about 50% smaller, or even about 60%, 65%, 66%, 67%, 68%, 69%, 70%, or even about 70.4% smaller than the core diameter at base of head of GRAND RAPIDS (see USDA criteria);

The ratio of spread of frame leaves/core diameter of NUN 09051 is at least about 40% bigger, or even about 42.5%, 45%, 47.5%, 50%, 52.5%, 55%, 57.5%, 60%, 61% or even about 61.9% bigger than the ratio head/core diameter of GRAND RAPIDS (see USDA criteria);

The core height from base of head to apex of NUN 09051 is at least about 40% smaller, or even about 45%, 50%, 52%, 54%, 56%, 57%, 58%, 59%, 60%, or even about 61% smaller than the core height from base of head to apex of GRAND RAPIDS (see USDA criteria);

The bolting class of NUN 09051 is very slow, whereas the bolting class of GRAND RAPIDS is rapid (see USDA criteria);

The height of mature seed stalk of NUN 09051 is at least about 45% smaller, or even about 46%, 47%, 48%, 49%, 50%, 51%, 52%, 53%, 54%, 55%, 56% or even about 56.2% smaller than the height of mature seed stalk of GRAND RAPIDS (see USDA criteria);

The color of bolter leaves of NUN 09051 is purple, while the color of bolter leaves of GRAND RAPIDS is light green (see USDA criteria);

NUN 09051 is not susceptible to heat dormancy, whereas GRAND RAPIDS is susceptible to heat dormancy (see USDA criteria);

The shape of cotyledons of NUN 09051 is intermediate, whereas the shape of cotyledons of GRAND RAPIDS is broad (see USDA criteria);

The color of fourth leaf of NUN 09051 is light green, whereas the color of fourth leaf of GRAND RAPIDS is yellow green (see USDA criteria);

The fourth leaf of NUN 09051 is uncupped, whereas the fourth leaf of GRAND RAPIDS shows slight cupping (see USDA criteria);

The incision depth (deepest penetration of the margin) of mature leaves of NUN 09051 is deep, while the incision depth of mature leaves of GRAND RAPIDS is moderate (see USDA criteria);

The indentation (finest divisions of the margin) of mature leaves of NUN 09051 is deeply dentate, while the indentation of mature leaves of GRAND RAPIDS is shallowly dentate (see USDA criteria);

The size of mature leaves of NUN 09051 is small, whereas the size of mature leaves of GRAND RAPIDS is medium (see USDA criteria);

The glossiness of mature leaves of NUN 09051 is dull, whereas the glossiness of mature leaves of GRAND RAPIDS is moderate (see USDA criteria);

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The blistering of mature leaves of NUN 09051 is absent/slight, whereas the blistering of mature leaves of GRAND RAPIDS is moderate (see USDA criteria);

The leaf thickness of mature leaves of NUN 09051 is thin, while the leaf thickness of mature leaves of standard regional check variety GRAND RAPIDS is intermediate (see USDA criteria);

The midrib configuration of NUN 09051 is flattened, whereas the midrib configuration of GRAND RAPIDS is moderately raised (see USDA criteria);

The spread of bolter plant (at widest point) of NUN 09051 is at least about 10% smaller, or even about 11%, 12%, 13%, 14%, 15%, 16%, 17%, or even about 17.2% smaller than the spread of bolter plant of GRAND RAPIDS (see USDA criteria);

concerning the bolting habit of NUN 09051, it has an absence of lateral shoots, whereas the bolting habit of GRAND RAPIDS shows a presence of lateral shoots (see USDA criteria);

concerning the bolting habit of NUN 09051, it has an absence of basal side shoots, whereas the bolting habit of GRAND RAPIDS shows a presence of lateral shoots (see USDA criteria).

The morphological and/or physiological differences between NUN 09051 and other known varieties, such as MULTY or GRAND RAPIDS (which is a standard regional check variety) can easily be established by growing NUN 09051 next to the other varieties (in the same field or greenhouse under the same environmental conditions), preferably in several locations which are suitable for lettuce cultivation, and measuring morphological and/or physiological characteristics of a number of plants (e.g., to calculate an average value (of at least 10 or even more plants which were grown under the same conditions) and to determine the variation range/uniformity within the variety). Differences between varieties can be determined throughout the growing period as long as the plants to be compared developed the parts of said plants which are compared with each other. For example, mature leaves can be compared with each other when the plants developed these leaf stages. This can be the case, e.g., after 20, after 25, after 30 days or at harvest day. Comparative varieties which can be grown in the same field are GRAND RAPIDS, MULTY and others. These are commercially available varieties.

For example, trials can be carried out in Spain, the Netherlands or the USA whereby e.g., seed characteristics, cotyledon characteristics, fourth leaf characteristics, mature plant characteristics, such as plant head diameter, head shape, head size, head weight, butt and core characteristics, time of bolting (number of days from first water date to seed stalk emergence), seed stalk characteristics, bolter habit, maturity (earliness of harvest-mature head formation), regional and/or seasonal adaptation, pest and/or disease resistance/susceptibility can be measured and directly compared. Also resistance against physiological stresses, such as tip burn, heat-, drought-, cold-resistance, etc. and/or post-harvest characteristics of heads or leaves can be compared, such as pink rib, russet spotting, rusty brown discoloration, internal rib necrosis (blackheart, grey rib, grey steak) and brown stain can be measured using known methods, e.g. as indicated in the USDA descriptors. The morphological and/or physiological characteristics may vary with variation in the environment (such as temperature, light intensity, day length, humidity, soil, fertilizer use), which is why a comparison under the same environmental conditions is preferred. Colors can best be measured against The Munsell Book of Color (Munsell Color Macbeth Division of Koll-

morgan Instruments Corporation) or using the RHS-Chart (see, e.g., worldwide net: <http://www.rhs.org.uk/Plants/RHS-Publications/RHS-colour-charts>).

In one embodiment a lettuce plant is provided, designated NUN 09051, representative seeds of said lettuce plant having been deposited under accession number NCIMB 42446.

In another aspect, a lettuce plant is provided, which (statistically significant) differs from NUN 09051 in at least one morphological and/or physiological characteristic, but which does not differ from NUN 09051 in the following characteristics when grown under the same conditions: 1) color of mature leaves; 2) distribution and concentration of anthocyanin in the mature leaves; 3) head size; 4) head weight; 5) core diameter at base of head.

In a further aspect, a lettuce plant is provided, which (statistically significant) differs from NUN 09051 in at least one morphological and/or physiological characteristic, but which does not differ from NUN 09051 in the following characteristics when grown under the same conditions: 1) color of mature leaves; 2) distribution and concentration of anthocyanin in the mature leaves; 3) head size; 4) head weight; 5) core diameter at base of head, and which further does not significantly differ from the plant designated NUN 09051 in one or more of the following characteristics when grown under the same conditions: 6) core height from base of head to apex; 7) spread of frame leaves; 8) glossiness of mature leaves; 9) blistering of mature leaves; 10) margin incision depth (deepest penetration of the margin); 11) margin indentation (finest divisions of the margin); 12) length/width index of fourth leaf; 13) number of days from first wate date to seed stalk emergence; 14) height of mature seed stalk.

In one embodiment any of the above lettuce plants have/are: 1) a purple color of mature leaves, e.g. RHS Purple Group N77A; 2) a throughout distribution and/or intense concentration of anthocyanin in the mature leaves; 3) a small head size; 4) a head weight of at least about 40 g, or preferably at least about 45 g, 50 g, 55 g, 60 g, or even at least about 60.7 g; 5) a core diameter at base of head of at least about 4 mm, or preferably of at least about 4.2 mm, 4.4 mm, 4.6 mm, 4.8 mm, or even at least about 5 mm; 6) a core height from base of head to apex of at least about 5.5 mm, or preferably of at least about 5.7 mm, 5.9 mm, 6 mm, 6.2 mm, 6.4 mm, 6.6 mm, 6.8 mm, 7 mm, 7.2 mm, 7.4 mm, or even at least about 7.6 mm; 7) a spread of frame leaves of at least about 15.3 cm, or preferably at least about 15.5 cm, 16 cm, 16.5 cm, or even at least about 17 cm; 8) a dull glossiness of mature leaves; 9) absent/slight blistering of mature leaves; 10) a deep margin incision depth (deepest penetration of the margin); 11) a deeply dentate margin indentation (finest divisions of the margin).

In a further embodiment a lettuce plant is provided, which (statistically significantly) differs from the lettuce plant designated NUN 09051, representative seeds of said lettuce plant hybrid having been deposited under accession number NCIMB 42446, in at least one, two, three, four, or five morphological and/or physiological characteristics when grown under the same environmental conditions, whereby the morphological and/or physiological characteristics are those of Table 1. The plant does, thus, not differ in a statistically significant way from NUN 09051 in any of the other morphological and/or physiological characteristics of Table 1 when grown under the same conditions.

In one embodiment a lettuce plant is provided, designated NUN 09051, which does not (statistically significantly) differ in any of the morphological and/or physiological characteristics of Table 1 from plants grown from seeds

deposited under accession number NCIMB 42446 when grown under the same environmental conditions.

In one aspect, the above described lettuce plants are obtained from in vitro cell or tissue cultures. As already mentioned, in vitro cell or tissue cultures are known in the art and can be used to either vegetatively reproduce the plant from which the cells or tissues were obtained or to identify and/or select phenotypic variants, and to regenerate such variants. Once selected, such selected variants can then in turn also be reproduced true to type using in vitro cell or tissue culture.

Thus in one aspect, a lettuce plant is provided which is clonally propagated (it is a vegetative reproduction) from NUN 09051 cells or tissue and which comprises all the distinguishing characteristics of NUN 09051 when grown under the same environmental conditions. In another aspect it further comprises one or more of the further distinguishing characteristics. In yet another aspect it comprises all morphological and/or physiological characteristics of NUN 09051 as given in Table 1. And in yet a further aspect it comprises all morphological and/or physiological characteristics of NUN 09051 as given in Table 1, except that it significantly differs from NUN 09051 in one, two, three, four, or five of the morphological and/or physiological characteristics of Table 1.

Seeds

The present invention does not only provide plants designated NUN 09051. Also provided are seeds of lettuce variety NUN 09051. A representative sample of said seeds (at least 2500 seeds) has been deposited under the Budapest Treaty with Accession Number NCIMB 42446.

Seeds of NUN 09051 are obtainable by, e.g., growing plants from the seeds deposited under Accession number NCIMB 42446 and allowing, e.g., self-pollination and/or cross-pollination and collecting seeds from the resulting plants. The resultant NUN 09051 seeds can be grown to produce plants designated NUN 09051. Moreover, a seed dedicated NUN 09051 also refers to a seed wherein the plant grown therefrom shows essentially all characteristics of NUN 09051. Seeds of NUN 09051 are also obtainable by vegetative propagation from plant cells or tissue of a plant grown from seeds of NUN 09051.

In one embodiment, a plurality of NUN 09051 seeds are packaged into small and/or large containers (e.g., bags, cartons, cans, etc.). The seeds may be pelleted prior to packing (to form pills or pellets) and/or treated with various compounds, such as seed coatings.

Seed pelleting can be combined with film coating (Halmer, P. 2000. Commercial seed treatment technology. In: Seed technology and its biological basis. Eds: Black, M. and Bewley, J. D., pages 257-286). Pelletting creates round or rounded shapes, which are easily sown with modern sowing machines. A pelletting mixture typically contains seeds and at least glue and filler material. The latter could be, for example, clay, mica, chalk or cellulose. In addition, certain additives can be included to improve particular properties of the pellet, e.g., a seed treatment formulation comprising at least one insecticidal, acaricidal, nematocidal or fungicidal compound can be added directly into the pelletting mixture or in separate layers. A seed treatment formulation can include one of these types of compounds only, a mixture of two or more of the same type of compounds or a mixture of one or more of the same type of compounds with at least one other insecticide, acaricide, nematocide or fungicide.

Formulations especially suitable for the application as a seed treatment can be added to the seed in the form of a film coating including also the possibility of using the coating in

or on a pellet, as well as including the seed treatment formulation directly into the pellet mixture. Characteristically, a film coating is a uniform, dust-free, water permeable film, evenly covering the surface of all individual seeds (Halmer, P. 2000. Commercial seed treatment technology. In: Seed technology and its biological basis. Eds: Black, M. and Bewley, J. D., pages 257-286). Besides the formulation, the coating mixture generally also contains other ingredients such as water, glue (typically a polymer), filler materials, pigments and certain additives to improve particular properties of the coating. Several coatings can be combined on a single seed.

In addition, several combinations with film coating are possible: the film coating can be added on the outside of the pellet, in between two layers of pelleting material, and directly on the seed before the pelleting material is added. Also more than 1 film coating layer can be incorporated in a single pellet. A special type of pelleting is encrusting. This technique uses less filler material, and the result is a 'mini-pellet'.

Seeds may also be primed. Of all the commercially planted vegetable seeds, lettuce is the most often primed.

Priming is a water-based process that is performed on seeds to increase uniformity of germination and emergence from the soil, and thus enhance vegetable stand establishment. Priming decreases the time span between the emergence of the first and the last seedlings. Methods how to prime lettuce seeds are well known in the art (see, e.g., Hill et al HortScience 42(6): 1436, 2007).

Plant and Parts Thereof

Also provided are parts of the lettuce plants designated NUN 09051 such as micro spores, pollen, ovaries, flowers, stalks, heads, ovules, leaves, shoots, seeds, embryos, embryo sacs, roots, cuttings, stems, cells, protoplasts, meristems, buds etc. of variety NUN 09051, or parts of any of these. Such parts may be (part of) sexual reproduction tissues, which include, without limitation microspores, pollen, flowers, ovaries, ovules, embryo sacs and egg cells, or vegetative cells or tissues, which include, without limitation cuttings, roots, stems, cells or protoplasts, leaves, cotyledons, meristems and buds.

Moreover, there is provided a cell culture or tissue culture of lettuce variety NUN 09051 in which the cell- or tissue culture is derived from a tissue such as, for example and without limitation, leaves, pollen, embryos, cotyledon, hypocotyls, meristematic cells, roots, root tips, anthers, flowers, seeds or stems. For example, leaf-, hypocotyl- or stem-cuttings may be used in tissue culture.

Also provided are lettuce plants regenerated from the above-described plant parts, or regenerated from the above-described cell or tissue cultures, said regenerated plant having essentially all the morphological and physiological characteristics of lettuce variety NUN 09051. These plants can also be referred to as "vegetative propagations of NUN 09051".

Also provided are harvested leaves and/or heads of NUN 09051 and packages comprising a plurality of leaves and/or heads of NUN 09051 such as 1, 2, 3, 4, 5, 12, 12, 20 heads.

Growing Plants

Lettuce plants can be produced by seeding directly in the ground (e.g., soil such as soil in a field) or by germinating the seeds in controlled environment conditions (e.g., greenhouses) and then transplanting the seedlings into the field (see, e.g., Gonai et al., J. of Exp. Bot., 55(394): 111, 2004; Louise Jackson et al, Publication 7215 ISBN 978-1-60107-007-4 and Publication 7216 ISBN 978-1-60107-008-1 and the world wide web at "anrcatalog.ucdavis.edu" search:

lettuce for cultivation, harvesting, handling and postharvest methods commonly used). Lettuce may also be grown in tunnels.

Moreover, lettuce can be grown in hydroponic cultures as described in, e.g., US 2008/0222949.

Hydroponics is the cultivation of plants without soil. There are 6 basic types of hydroponic systems: Wick, Raft (also called Water Culture), Ebb and Flow (also called Flood & Drain), Drip, Nutrient Film Technique, and Aeroponic. There are hundreds of variations on these basic types of systems, and most hydroponics systems can be described as a variation or combination of these six types.

In wick systems, plants are grown in a soil-less growing medium and a solution containing water and nutrients is delivered using wicks that absorb the solution from a reservoir and deliver the solution to the growing medium. The roots of the plants are optionally prevented from or allowed to grow in the solution.

In raft systems, plants are grown in a soil-less growth medium that is floated by a raft on the surface of a solution containing water and nutrients. The roots of the plants are optionally prevented from or allowed to grow in the solution.

In Ebb and Flow systems, plants are grown in a soil-less growth medium in a flooding tray. Solution containing water and nutrients is intermittently delivered to the flooding tray and then returned to a reservoir. The plant roots are directly or indirectly contacted by the solution in the flooding tray. Optionally the solution is delivered by a pump and returned by gravity.

In drip systems, plants are grown in a soil-less growing medium. A solution containing water and nutrients is delivered in drips to the growing medium. The solution that is not used by the plants is either recycled (recovery systems) or discarded (non-recovery systems). In recovery systems, although there often is a reservoir, the plant roots are typically prevented from growing directly in the solution.

Nutrient film technique (N.F.T.) systems constantly deliver a thin film of a nutrient and water containing solution. The plants are grown in a soil-less growth medium and the roots are allowed to grow outside the medium into the surrounding air or the plants are grown directly suspended in the air without a growing medium. The roots that grow in the air are constantly contacted by the thin film of solution. Typically the solution is recycled. Optionally the solution is delivered by a pump and returned by gravity.

Aeroponic systems deliver the solution as a fine spray. The plants are grown in a soil-less growth medium and the roots are allowed to grow outside the medium into the surrounding air or the plants are grown directly suspended in the air without a growing medium. The roots that grow in the air are intermittently sprayed or misted with a solution containing water and nutrients. The roots of the plants are optionally prevented from or allowed to grow in the solution.

Furthermore, different lettuce varieties may be grown as "composite lettuce" (see, e.g., EP 1 197 137 A1).

Plants and Progeny

In another embodiment, plants and parts of lettuce variety designated NUN 09051 and progeny of lettuce variety designated NUN 09051 are provided, e.g., grown from seeds, produced by sexual or vegetative reproduction, regenerated from the above-described plant parts, or regenerated from cell or tissue culture of the lettuce variety designated NUN 09051, in which the reproduced (seed propagated or vegetatively propagated) plant has all or essentially all morphological and physiological characteristics of lettuce

In one embodiment, said progeny of the lettuce variety designated NUN 09051 can be modified in one, two, three, four or five characteristics (e.g. different shape of apical margin of leaves or further resistances), in which the modification is a result of, for example and without limitation, mutagenesis or transformation with a transgene. A progeny can be a first generation progeny or a progeny up to generation two, three, four, five, six, seven or even higher.

Furthermore, the invention provides for progeny of variety NUN 09051 such as progeny obtained by, e.g., selfing NUN 09051 one or more times and/or cross-pollinating NUN 09051 with another lettuce plant of a different variety or breeding line, or with a lettuce plant of the invention one or more times. In particular, the invention provides for progeny that retain essentially all morphological and physiological characteristics of NUN 09051.

In still another embodiment, there is provided progeny of lettuce variety NUN 09051 produced by sexual or vegetative reproduction, grown from seeds, regenerated from the above-described plant parts, or regenerated from the above-described tissue culture of the lettuce variety or a progeny plant thereof, in which the sexually or vegetatively propagated plant has essentially all the morphological and physiological characteristics of lettuce variety NUN 09051.

Moreover, also an Essentially Derived Variety (EDV) of a lettuce plant designated NUN 09051 is provided. In one embodiment, an EDV exhibits one, two, three or more than three physiological and/or morphological characteristics which are different from those of NUN 09051 but which otherwise comprises the distinguishing characteristics of NUN 09051 and/or has essentially all physiological and morphological characteristics of a lettuce plant designated NUN 09051. In one embodiment, said EDV has essentially all physiological and/or morphological characteristics of a lettuce plant designated NUN 09051 but has one or two physiological and morphological characteristic(s) which is (are) different from those of the corresponding physiological and/or morphological characteristics of a plant designated NUN 09051 (i.e. has additional trait(s)).

In one embodiment, NUN 09051 may also be mutated (by e.g. irradiation, chemical mutagenesis, heat treatment, etc.) and mutated seeds or plants may be selected in order to change one or more characteristics of NUN 09051. Also natural mutants may be identified and used in breeding. Methods such as TILLING and/or EcoTILLING may be applied to lettuce populations in order to identify mutants. Similarly, NUN 09051 may be transformed and regenerated, whereby one or more chimeric genes are introduced into the variety. Transformation can be carried out using standard methods, such as *Agrobacterium tumefaciens* mediated transformation or biolistics, followed by selection of the transformed cells and regeneration into plants. A desired trait (e.g. genes conferring pest or disease resistance, herbicide, fungicide or insecticide tolerance, etc.) can be introduced into NUN 09051, or progeny thereof, by transforming NUN 09051 or progeny thereof with a transgene that confers the desired trait, wherein the transformed plant retains essentially all the morphological and physiological characteristics of NUN 09051 or the progeny thereof and contains the desired trait.

The invention also provides for progeny of lettuce variety NUN 09051 obtained by further breeding with NUN 09051. In one aspect progeny are F₁ progeny obtained by crossing NUN 09051 with another plant or S1 progeny obtained by selfing NUN 09051. Also encompassed are F₂ progeny obtained by selfing the F₁ plants. "Further breeding" encompasses traditional breeding (e.g., selfing, crossing, back-

crossing), marker assisted breeding, and/or mutation breeding. In one embodiment, the progeny have all the physiological and morphological characteristics of variety NUN 09051 when grown under the same environmental conditions.

In one aspect haploid plants and/or double haploid plants of NUN 09051 are encompassed herein. Haploid and double haploid (DH) plants can for example be produced by anther or microspore culture and regeneration into a whole plant. For DH production chromosome doubling may be induced using known methods, such as colchicine treatment or the like.

The invention also provides a method of producing plants of variety designated NUN 09051, or its progeny, or an EDV, or a part thereof, comprising vegetative propagation of a plant designated NUN 09051. In one embodiment, said vegetative propagation comprises regenerating a whole plant from a part of variety designated NUN 09051. In one embodiment, said part of a plant is a cutting, root, stem, cell, protoplast, leaf meristem, bud, cell culture or a tissue culture (e.g., in vitro meristem culture, see Murakami and Oka, 1996, Plant Tissue Culture Letters 13(3): 339). Thus, a vegetative propagated plant (or a part thereof) is provided having at least the essential morphological and physiological characteristics of a lettuce plant designated NUN 09051 when grown under the same environmental conditions. In some embodiments, said propagated plant has at least one or more morphological and physiological characteristic in common with a lettuce plant designated NUN 09051. Such characteristics are, e.g. the seed color, glossiness, shape of cotyledons etc. as outlined in this application.

The invention also provides for a method of producing a vegetatively propagated plant of variety designated NUN 09051, or a part thereof, comprising regeneration of said plant from a cell culture or a tissue culture. Also provided are plants which are regenerated from such a cell culture or tissue culture. In one embodiment such plants are haploid or double haploid plants of NUN 09051.

In still another aspect, the present invention provides a method of producing a plant derived from NUN 09051, the method comprising the steps of: (a) preparing a progeny plant derived from NUN 09051, wherein said preparing comprises crossing a plant of NUN 09051 either as a male or as a female parent with a second plant, or selfing NUN 09051, or vegetative propagation of NUN 09051, and (b) collecting seeds from said crossing or selfing or regenerating a whole plant from the vegetative cell- or tissue culture. The invention further relates to seeds and plants obtained by this method.

In one embodiment, crossing a plant of NUN 09051 either as a male or as a female parent with a second plant refers to cross-pollination of two plants of NUN 09051 or of crossing NUN 09051 with an EDV of NUN 09051, or crossing two EDVs of NUN 09051 with each other. In another embodiment, crossing a plant of NUN 09051 either as a male or as a female parent with a second plant refers to cross-pollination of NUN 09051 with a plant of another lettuce variety, breeding line or wild *Lactuca* species, e.g. *L. virosa* or *L. serriola*.

In yet a further aspect, the invention provides for a method of producing a new lettuce plant, e.g., a F₁ hybrid. The method comprises, crossing NUN 09051, either as male or as female parent, with a second lettuce plant which can be a second lettuce plant of the same variety, a lettuce plant of a different variety, a breeding line (e.g. an elite line) or a wild relative of lettuce (e.g., *Lactuca virosa* or *Lactuca serriola*) variety designated NUN 09051, e.g., as outlined in table 1.

or genetic transformation techniques to produce a progeny of NUN 09051. The method may further comprise selfing the F_1 to produce an F_2 (and optionally further selfing selected F_2 plants to produce an F_3 , etc.), and backcrossing an F_1 , F_2 , F_3 , etc. to NUN 09051 or to an EDV of NUN 09051, to produce a backcross population (BC_1), which may then be selfed to produce a BC_1S_1 population, etc., or may be used to produce a BC_2 population, or other backcross populations.

Thus, in one aspect a method for developing a lettuce plant in a lettuce breeding program is provided, using a lettuce plant of the invention, or its parts, as a source of plant breeding material. Suitable plant breeding techniques are recurrent selection, backcrossing, pedigree breeding, line selection, mass selection, mutation breeding and/or genetic marker enhanced selection. For example, in one aspect, the method comprises crossing a lettuce plant designated NUN 09051, or progeny thereof, with a different lettuce plant selected from the group consisting of a plant of the same variety, a lettuce plant of a different variety, a (breeding) line, or a wild relative of lettuce (e.g., *L. virosa* or *L. serriola*), and wherein one or more offspring of the crossing are subject to one or more plant breeding techniques selected from the group consisting of recurrent selection, backcrossing, pedigree breeding, line selection, mass selection, mutation breeding and genetic marker enhanced selection (see e.g. Allard (1960), John Wiley & Sons, Inc: Principles of plant breeding, Library of Congress Catalog Card Number: 60-14240).

In still yet another aspect, the present invention provides a method of producing a new plant comprising (a) crossing NUN 09051, or a progeny plant thereof, with itself or a second plant to produce a seed of a progeny plant of a subsequent generation. In further embodiments, the method may additionally comprise: (c) growing a progeny plant of a subsequent generation from said seed of a progeny plant of a subsequent generation and crossing the progeny plant of a subsequent generation with itself or a second plant; and repeating the steps for an additional 3-10 generations to produce a plant derived from NUN 09051. The plant derived from NUN 09051 may be an inbred line, and the aforementioned repeated crossing steps may be defined as comprising sufficient inbreeding to produce the inbred line. In the method, it may be desirable to select particular plants resulting from step (c) for continued crossing according to steps (b) and (c). By selecting plants having one or more desirable traits, a plant derived from NUN 09051 is obtained which possesses some of the desirable traits of the line as well as potentially other selected traits.

Pedigree Selection

In one embodiment, Pedigree selection is used as breeding method for developing a lettuce variety. Pedigree selection, also known as the "Vilmorin system of selection," is described in, e.g., Allard, 1960, John Wiley & Sons, Inc.: Principles of plant breeding: 119-128, Library of Congress Catalog Card Number: 60-14240.

In general, selection is first practiced among F_2 plants. In the next season, the most desirable F_3 lines are first identified, then desirable F_3 plants within each line are selected. The following season and in all subsequent generations of inbreeding, the most desirable families are identified first, then desirable lines within the selected families are chosen, and finally desirable plants within selected lines are harvested individually. A family refers to lines that were derived from plants selected from the same progeny from the preceding generation.

Using this pedigree method, two parents may be crossed using an emasculated female and a pollen donor (male) to produce F_1 offspring. Lettuce is an obligate self-pollination species, which means that pollen is shed before stigma emergence, assuring 100% self-fertilization. Therefore, in order to optimize crossing, a method of misting may be used to wash the pollen off prior to fertilization to assure crossing or hybridization.

Parental varieties are selected from commercial varieties that individually exhibit one or more desired phenotypes. Additionally, any breeding method involving selection of plants for the desired phenotype can be used in the method of the present invention.

The F_1 may be self-pollinated to produce a segregating F_2 generation. Individual plants may then be selected which represent the desired phenotype in each generation (F_3 , F_4 , F_5 , etc.) until the traits are homozygous or fixed within a breeding population.

Thus, progeny in connection with Pedigree selection are either the generation (seeds) produced from the first cross (F_1) or selfing (S_1), or any further generation produced by crossing and/or selfing (F_2 , F_3 , F_4 , F_5 , F_6 , F_7 , etc.) and/or backcrossing (BC_1 , BC_2 , BC_3 , BC_4 , BC_5 , BC_6 , BC_7 , etc.) one or more selected plants of the F_1 and/or S_1 and/or BC_1 generation (or plants of any further generation, e.g. the F_2) with another lettuce plant (and/or with a wild relative of lettuce). Using common breeding methods such as backcrossing or recurrent selection, one or more specific characteristics may be introduced into NUN 09051, to provide an EDV of NUN 09051.

In one embodiment, this invention is directed to methods for producing a lettuce plant by crossing a first parent lettuce plant with a second parent lettuce plant wherein either the first or second parent lettuce plant is lettuce NUN 09051. Further, both first and second parent lettuce plants can come from NUN 09051. Still further, this invention also is directed to methods for producing a NUN 09051-derived lettuce plant by crossing NUN 09051 with a second lettuce plant and growing the progeny seed, and repeating the crossing and growing steps with the NUN 09051-derived plant from zero to seven times. Thus, any such methods using NUN 09051 are part of this invention: selfing, backcrosses, hybrid production, crosses to populations, and the like. All plants produced using NUN 09051 as a parent are within the scope of this invention, including plants derived from NUN 09051. Advantageously, NUN 09051 is used in crosses with other, different, lettuce varieties to produce first generation (F_1) lettuce hybrid seeds and plants with superior characteristics.

It should be understood that the lettuce can, through routine manipulation of cytoplasmic or other factors, be produced in a male-sterile form. Such embodiments are also contemplated within the scope of the present claims.

General crossing methods for lettuce are, e.g., described in US 2009/0271897 A1. Such methods include but are not limited to:

Manual removal of anther tubes from flowers, misting the designated male flowers to wash the pollen off prior to fertilization and pollen from another variety or donor parent is then introduced by gently rubbing the stigma and style of the donor parent to the maternal parent. Tags with the pertinent information on date and pedigree are then secured to the flowers in order to keep track.

About 3 weeks after pollination, seeds are harvested when the involucre have matured. The seeds are eventually sown and in the presence of markers such as leaf color or leaf margins, the selfed or maternal seedlings or

plants are identified. Generally, in case of crossing with a plant of a different variety, there are no visible markers and breeders must wait until the F2 generations when expected segregation patterns for the genetic character of interest can be followed.

Use of male sterility systems, such as genetic male sterility (GMS), see e.g. Hayashi et al. *Euphytica* Vol 180(3): 429-436 or cytoplasmic male sterility (CMS). Genetically engineered sterility is also available. Non-limiting examples of genetically engineering male sterility in lettuce are by expression of a ribonuclease gene under the control of a tapetum-specific promoter (see Reynaerts et al., *Scientia Horticulturae* (1993) 55 (1-2): 125-129). Other male sterile systems include the expression of beta-glucanase via a tapetum-specific promoter (see Curtis et al., *Plant Science Limerick* (1996) 113(1): 113-119).

Also provided is a method of producing a hybrid lettuce seed comprised of crossing a first parent lettuce plant with a second parent lettuce plant and harvesting the resultant hybrid lettuce seed, in which the first parent lettuce plant or the second parent lettuce plant is the lettuce variety NUN 09051. Accordingly, a hybrid lettuce plant produced from crossing a first parent lettuce plant with a second parent lettuce plant and harvesting the resultant hybrid lettuce seed, wherein said first parent lettuce plant or said second parent lettuce plant is a lettuce plant designated NUN 09051 is provided, as well.

The invention provides for methods of producing EDVs (Essentially Derived Varieties), which retain essentially all morphological and physiological characteristics of NUN 09051 but which may differ from a lettuce plant designated NUN 09051 in one, two, three or more further morphological and/or physiological characteristics, but which are still genetically closely related to NUN 09051. The relatedness can, for example be determined by fingerprinting techniques (e.g., making use of isozyme markers and/or molecular markers such as SNP markers, AFLP markers, microsatellites, minisatellites, RAPD markers, RFLP markers and others). A plant is "closely related" to NUN 09051 if its DNA fingerprint is at least 80%, 90%, 95%, 97% or 98% identical to the fingerprint of NUN 09051. In a preferred embodiment amplified fragment length polymorphism (AFLP) markers are used for DNA fingerprinting (Vos et al. 1995, *Nucleic Acid Research* 23: 4407-4414). A closely related plant may have a Jaccard's Similarity index of at least about 0.8, preferably at least about 0.9, 0.95, 0.98 or more (van Eeuwijk and Law (2004), *Euphytica* 137: 129-137). In one embodiment a closely related plant of NUN 09050 has a Jaccard Similarity index of higher than 0.96. See also the Guidelines on Essentially Derived Varieties for lettuce published by the ISF (<http://www.worldseed.org/isf/edv.html>), where the technical protocol for assessing the Jaccard index is outlined. The following 10 AFLP primer combinations can be used: E33/M59, E35/M48, E35/M49, E35/M59, E35/M60, E38/M54, E44/M48, E44/M49, E45/M48, E45/M49.

By crossing and/or selfing also (one or more) single traits may be introduced into NUN 09051 (e.g., using backcrossing breeding schemes), while retaining the remaining morphological and physiological characteristics of NUN 09051. For example, disease resistance genes may be introduced, genes responsible for one or more quality traits (such as head quality), yield, etc. Both single genes (dominant, semidomi-

nant or recessive) and one or more QTLs (quantitative trait loci) may be transferred into NUN 09051 by breeding with NUN 09051.

Any pest or disease resistance genes may be introduced into NUN 09051, progeny thereof or into an EDV of NUN 09051. Resistance against one or more of the following diseases is preferably introduced into plants of the invention: downy mildew, *Sclerotinia rot*, *Botrytis*, powdery mildew, anthracnose, bottom rot, corky root rot, lettuce mosaic virus, big vein, lettuce aphid, beet western yellows and aster yellows. Resistance against one or more of the following pests is preferably present or introduced into plants of the invention: *Sclerotinia minor* (leaf drop), *Sclerotinia sclerotiorum* (leaf drop), *Rhizoctonia solani* (bottom drop), *Erysiphe cichoracearum* (powdery mildew), *Fusarium oxysporum* f. sp. *lactucae* (*Fusarium* wilt) resistance. Other resistance genes, against pathogenic viruses (e.g. Lettuce infectious yellows virus (LIYV), lettuce mosaic virus (LMV), Cucumber mosaic virus (CMV), Beet western yellows virus (BWYV), Alfalfa mosaic virus (AMV)), fungi, bacteria or lettuce pests may also be introduced. In one embodiment resistance against *Nasonovia ribisnigri* biotype Nr:0 and/or Nr:1 is introduced into NUN 09051.

Transgene

Also provided is a method of producing a lettuce plant having a desired trait, wherein the method comprises transforming the lettuce plant of the invention with a transgene that confers the desired trait, wherein the transformed plant retains essential all phenotypic and morphological characteristics of a NUN 09051 plant of the invention and contains the desired trait. Thus, a transgenic lettuce plant is provided which is produced by the method described above, wherein the plant comprises the desired trait and essentially all of the physiological and morphological characteristics of a NUN 09051 plant.

Many useful traits that can be introduced into NUN 09051 by e.g. crossing NUN 09051 with a transgenic lettuce plant comprising a desired transgene, as well as by directly introducing a transgene into NUN 09051 (or an EDV, or progeny of NUN 09051) by genetic transformation techniques. Genetic transformation may, therefore, be used to insert a selected transgene into the lettuce plants of the invention or may, alternatively, be used for the preparation of transgenic lettuce plants which can then be used as a source of the transgene(s), which can be introduced into NUN 09051 by e.g. backcrossing. Methods for the transformation of plants, including lettuce, are well known to those of skill in the art.

DNA sequences, whether from a different species or from the same species, which are inserted into the genome using transformation, are referred to herein collectively as "transgenes". A "transgene" also encompasses antisense, or sense and antisense sequences capable of gene silencing. Thus, the present invention also relates to transgenic NUN 09051 plants. In some embodiments of the invention, a transgenic NUN 09051 plants may contain at least one transgene but could contain at least 1, 2, 3, 4, 5, 6, or more transgenes.

One embodiment of the invention is a process for producing progeny of a plant designated NUN 09051 further comprising a desired trait, said process comprising transforming a NUN 09051 plant (or a cell or tissue of NUN 09051) with at least one transgene that confers a desired trait and/or crossing a plant designated NUN 09051 with a transgenic lettuce plant comprising a desired transgene so that the genetic material of the progeny that results from the cross contains the transgene(s). The DNA of the transgene is operatively linked to a regulatory element active in plant

cells (especially a promoter) and the transgene confers a trait selected from the group consisting of male sterility, male fertility, herbicide resistance, insect resistance, disease resistance, improved yield, improved nutritional quality or improved biotic or abiotic (e.g. drought or salt) stress tolerance. Another embodiment is the product produced by this process. In one embodiment the desired trait which is based on a transgene may be one or more of herbicide resistance, insect resistance, disease resistance, stress tolerance, modified fatty acid or modified carbohydrate metabolism. The specific transgene may be any known in the art or listed herein, including, a polynucleotide sequence conferring resistance to imidazolinone, sulfonyleurea, glyphosate, glufosinate, triazine, benzonitrile, cyclohexanedione, phenoxypyrron acid and L-phosphinothricin or a polynucleotide conferring resistance to nematodes, downy mildew, *Sclerotinia* rot, *Botrytis*, powdery mildew, anthracnose, bottom rot, corky root rot, lettuce mosaic virus, big vein, lettuce aphid, beet western yellows and aster yellows, *Sclerotinia minor* (leaf drop), *Sclerotinia sclerotiorum* (leaf drop), *Rhizoctonia solani* (bottom drop), *Erysiphe cichoracearum* (powdery mildew), *Fusarium oxysporum* f. sp. *Lactucae* (*fusarium* wilt), lettuce infectious yellows virus (LIYV), lettuce mosaic virus (LMV), Cucumber mosaic virus (CMV), Beet western yellows virus (BWYV), and Alfalfa mosaic virus (AMV).

Numerous methods for plant transformation have been developed, including biological and physical plant transformation protocols (see, e.g., Glick, B. R. and Thompson, J. E. Eds. (CRC Press, Inc., Boca Raton (1993): 67-88 and Armstrong, "The First Decade of Maize Transformation: A Review and Future Perspective" Maydica 1999 (44):101-109). In addition, expression vectors and in vitro culture methods for plant cell or tissue transformation and regeneration of plants are available. See, e.g., Glick, B. R. and Thompson, J. E. Eds. (CRC Press, Inc., Boca Raton (1993): 89-119).

A genetic trait which has been engineered into the genome of a particular lettuce plant may then be moved into the genome of another lettuce plant (e.g. another variety) using traditional breeding techniques that are well known in the plant breeding arts. For example, a backcrossing approach is commonly used to move a transgene from a transformed lettuce variety into an already developed lettuce variety, and the resulting backcross conversion plant will then comprise the transgene(s).

Various genetic elements can be introduced into the plant genome using transformation. These elements include, but are not limited to genes, coding sequences, inducible-, constitutive-, and tissue specific promoters, enhancing sequences, and signal and targeting sequences. For example, see the traits, genes, and transformation methods listed in U.S. Pat. No. 6,118,055.

Plant transformation involves the construction of an expression vector which will function in plant cells. Such a vector comprises DNA comprising a gene under control of, or operatively linked to, a regulatory element (for example a promoter). The expression vector may contain one or more such operably linked gene/regulatory element combinations. The vector(s) may be in the form of a plasmid and can be used alone or in combination with other plasmids to provide transformed lettuce plants using transformation methods as described below to incorporate transgenes into the genetic material of the lettuce plant(s).

Although also marker-free transformation methods are known, expression vectors generally include at least one genetic marker operably linked to a regulatory element (a

promoter, for example) that allows transformed cells containing the marker to be either recovered by negative selection, i.e., inhibiting growth of cells that do not contain the selectable marker gene, or by positive selection, i.e., screening for the product encoded by the genetic marker. Thus, vectors used for the transformation of lettuce cells are not limited so long as the vector can express an inserted DNA in the cells. For example, vectors comprising promoters for constitutive gene expression in lettuce cells (e.g., cauliflower mosaic virus 35S promoter) and promoters inducible by exogenous stimuli can be used. Examples of suitable vectors include pBI binary vector. The "lettuce cell" into which the vector is to be introduced includes various forms of lettuce cells, such as for example cultured cell suspensions, protoplasts, leaf sections, and callus.

Many commonly used selectable marker genes for plant transformation are well known in the transformation arts, and include, for example, genes that code for enzymes that metabolically detoxify a selective chemical agent which may be an antibiotic or a herbicide, or genes that encode an altered target which is insensitive to the inhibitor. A few positive selection methods are also known in the art.

One commonly used selectable marker gene for plant transformation is the neomycin phosphotransferase II (nptII) gene which, when under the control of plant regulatory signals, confers resistance to kanamycin (see, e.g., Fraley et al., Proc. Natl. Acad. Sci. USA (1983), 80: 4803-4807). Another commonly used selectable marker gene is the hygromycin phosphotransferase gene which confers resistance to the antibiotic hygromycin (see, e.g., Vanden Elzen et al., Plant Mol. Biol. (1985) 5: 299-302).

Additional selectable marker genes of bacterial origin that confer resistance to antibiotics include gentamycin acetyl transferase, streptomycin phosphotransferase and aminoglycoside-3'-adenyl transferase, the bleomycin resistance determinant. Other selectable marker genes confer resistance to herbicides such as glyphosate, glufosinate or bromoxynil. Further selectable markers such as mouse dihydrofolate reductase and plant acetolactate synthase are well known in the art. Also known are marker genes for plant transformation which require screening of presumptively transformed plant cells rather than direct genetic selection of transformed cells for resistance to a toxic substance such as an antibiotic. These genes are particularly useful to quantify or visualize the spatial pattern of expression of a gene in specific tissues and are frequently referred to as reporter genes because they can be fused to a gene or gene regulatory sequence for the investigation of gene expression. The use of such markers is also encompassed by the present invention.

The gene encoding Green Fluorescent Protein (GFP) can also be utilized as a marker for gene expression in prokaryotic and eukaryotic cells (Chalfie et al., Science (1994) 263: 802-805). GFP and mutants of GFP may be used as screenable markers.

Genes included in expression vectors must be driven by a nucleotide sequence comprising a regulatory element, for example, a promoter. Several types of promoters are well known in the transformation arts as are other regulatory elements that can be used alone or in combination with promoters.

As used herein, "promoter" includes reference to a region of DNA upstream from the start of transcription and involved in recognition and binding of RNA polymerase and other proteins to initiate transcription. A "plant promoter" is a promoter capable of initiating transcription in plant cells. Exemplary promoters are well known in the art such as inducible promoters, constitutive promoters, tissue-specific

promoters or tissue-preferred promoters. One example is the cauliflower mosaic virus 35S promoter.

Transport of a protein produced by transgenes to a sub-cellular compartment such as the chloroplast, vacuole, peroxisome, glyoxysome, cell wall or mitochondrion or for secretion into the apoplast, is accomplished by means of operably linking the nucleotide sequence encoding a signal sequence to the 5' and/or 3' region of a gene encoding the protein of interest. Targeting sequences at the 5' and/or 3' end of the structural gene may determine during protein synthesis and processing where the encoded protein is ultimately compartmentalized.

The presence of a signal sequence directs a polypeptide to either an intracellular organelle (e.g. chloroplasts) or sub-cellular compartment or for secretion to the apoplast. Many signal sequences are known in the art (see, e.g., Becker et al., *Plant Mol. Biol.* (1992) 20: 49-60; or Knox, C., et al., *Plant Mol. Biol.* (1987) 9: 3-17).

By means of the present invention, plants can be genetically engineered to express various phenotypes of horticultural interest. Through the transformation of lettuce the expression of genes can be altered to enhance disease resistance, insect resistance, herbicide resistance, stress tolerance, horticultural quality, and other traits. Transformation can also be used to insert DNA sequences which control or help control male sterility or fertility restoration. DNA sequences native to lettuce as well as non-native DNA sequences can be transformed into lettuce and used to alter levels of native or non-native proteins. Various promoters, targeting sequences, enhancing sequences, and other DNA sequences can be inserted into the genome for the purpose of altering the expression of proteins. Reduction of the activity of specific genes (also known as gene silencing, or gene suppression) is desirable for several aspects of genetic engineering in plants.

Many techniques for gene silencing are well known to one of skill in the art, including, but not limited to, knock-outs (such as by insertion of a transposable element such as mu) or other genetic elements such as a FRT, Lox or other site specific integration site, antisense technology, co-suppression, RNA interference, virus-induced gene silencing, target-RNA-specific ribozymes, ribozymes, oligonucleotide mediated targeted modification, Zinc-finger targeted molecules; and other methods or combinations of the above methods known to those of skill in the art.

Likewise, by means of the present invention, other genes can be expressed in transformed plants. More particularly, plants can be genetically engineered to express various phenotypes of interest.

Exemplary nucleic acids which may be introduced to the lettuce lines of this invention include, for example, DNA sequences or genes from another species, or even genes or sequences which originate from, or are present in, the same species, but are incorporated into recipient cells by genetic engineering methods rather than classical reproduction or breeding techniques. However, the term "exogenous" is also intended to refer to genes that are not normally present in the cell being transformed, or perhaps simply not present in the form, structure, etc., as found in the transforming DNA segment or gene, or genes which are normally present and that one desires to express in a manner that differs from the natural expression pattern, e.g., to over-express. Thus, the term "exogenous" gene or DNA is intended to refer to any gene or DNA segment that is introduced into a recipient cell, regardless of whether a similar gene may already be present in such a cell. The type of DNA included in the exogenous DNA can include DNA which is already present in the plant

cell, DNA from another plant, DNA from a different organism, or a DNA generated externally, such as a DNA sequence containing an antisense message of a gene, or a DNA sequence encoding a synthetic or modified version of a gene.

Non-limiting examples of particular genes and corresponding phenotypes one may choose to introduce into a lettuce plant include one or more genes for insect tolerance, such as a *Bacillus thuringiensis* (B.t.) gene, disease tolerance such as genes for fungal or bacterial disease control, herbicide tolerance such as genes conferring glyphosate tolerance, and genes for quality improvements such as yield, nutritional enhancements, environmental or stress tolerances, or any desirable changes in plant physiology, growth, development, morphology or plant product(s). A more detailed list of genes implicated in this regard includes, but is not limited to, genes that confer resistance to pests or disease and that encode: a) plant disease resistance genes (plant defenses are often activated by specific interaction between the product of a disease resistance gene (R) in the plant and the product of a corresponding avirulence (Avr) gene in the pathogen, b) genes conferring resistance to a pest, such as a nematode or insects (e.g., insect-specific hormones or pheromones, or insect-specific peptides or neuropeptides which, upon expression, disrupts the physiology of the affected pest), c) an enzyme involved in the modification, including the post-translational modification, of a biologically active molecule; for example, a glycolytic enzyme, a proteolytic enzyme, a lipolytic enzyme, a nuclease, a cyclase, a transaminase, an esterase, a hydrolase, a phosphatase, a kinase, a phosphorylase, a polymerase, an elastase, a chitinase, and a glucanase, whether natural or synthetic, d) a viral-invasive protein or a complex toxin derived therefrom, e.g., the accumulation of viral coat proteins in transformed plant cells imparts resistance to viral infection and/or disease development effected by the virus from which the coat protein gene is derived, as well as by related viruses. Coat protein-mediated resistance has been conferred upon transformed plants against alfalfa mosaic virus, cucumber mosaic virus, and tobacco mosaic virus), e) a virus-specific antibody, f) a developmental-arrestive protein produced in nature by a pathogen or a parasite. Thus, fungal endo- α -1,4-D-polygalacturonases facilitate fungal colonization and plant nutrient release by solubilizing plant cell wall homo- α -1,4-D-galacturonase, g) genes involved in the Systemic Acquired Resistance (SAR) Response and/or the pathogenesis-related genes or antifungal genes, h) cystatin and cysteine proteinase inhibitors, i) defensin genes, j) genes conferring virus resistance, e.g. coat protein genes conferring resistance against Lettuce big vein disease.

Also included, but not limited to, are genes that confer resistance to an herbicide, e.g.: a) a herbicide that inhibits the growing point or meristem, such as an imidazolinone or a sulfonylurea. Exemplary genes in this category code for mutant ALS and AHAS enzyme, b) Glyphosate (resistance, e.g., conferred by mutant 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS) and *aroA* genes, respectively, and other phosphono compounds such as glufosinate, and pyridinooxy or phenoxy propionic acids and cyclohexanediones, c) a nucleotide sequences of glutamine synthetase genes which confer resistance to herbicides such as L-phosphinothricin, d) Nucleotide sequence of a PAT gene, e) a herbicide that inhibits hydroxyphenylpyruvate dioxygenase, f) a herbicide that inhibits photosynthesis, g) protoporphyrinogen oxidase (protox) enzyme serves as the target for a variety of herbicidal compounds.

Also included, but not limited to, are genes that confer or contribute to a value-added trait, such as: a) modified fatty acid metabolism, b) decreased phytate, c) modified carbohydrate composition, d) altered antioxidant content or composition,

Also included, but not limited to, are genes that control male sterility.

Also included, but not limited to, are genes that create a site for site specific DNA integration, genes that affect abiotic stress resistance, and other genes and transcription factors that affect plant growth and other traits such as yield, flowering, plant growth, and/or plant structure, can be introduced or introgressed into plants.

Transgenic lettuce can also be used as protein-factory, e.g. for the production of edible vaccines.

A vector can be introduced into lettuce cells by known methods, such as the polyethylene glycol method, polycation method, electroporation, *Agrobacterium*-mediated transfer, microprojectile bombardment and direct DNA uptake by protoplasts.

To effect transformation by electroporation, one may employ either friable tissues, such as a suspension culture of cells or embryogenic callus or alternatively one may transform immature embryos or other organized tissue directly. In this technique, one would partially degrade the cell walls of the chosen cells by exposing them to pectin-degrading enzymes (pectolyases) or mechanically wound tissues in a controlled manner. An example of electroporation of lettuce protoplasts is presented in Chupeau et al. (1989; *Bio/Technology* 7: 503-508).

Microprojectile bombardment techniques are widely applicable, and may be used to transform virtually any plant species. Examples involving microprojectile bombardment transformation with lettuce can be found in, e.g., Elliott et al. *Phys. Rev. Lett.* (2004) 92: 095501.

When using microprojectile bombardment, particles are coated with nucleic acids and delivered into cells by a propelling force. Exemplary particles include those comprised of tungsten, platinum, and preferably, gold. For the bombardment, cells in suspension are concentrated on filters or solid culture medium. Alternatively, immature embryos or other target cells may be arranged on solid culture medium. The cells to be bombarded are positioned at an appropriate distance below the macroprojectile stopping plate.

An illustrative embodiment of a method for delivering DNA into plant cells by acceleration is the Biolistics Particle Delivery System, which can be used to propel particles coated with DNA or cells through a screen, such as a stainless steel or Nytex screen, onto a surface covered with target lettuce cells. The screen disperses the particles so that they are not delivered to the recipient cells in large aggregates. It is believed that a screen intervening between the projectile apparatus and the cells to be bombarded reduces the size of projectiles aggregate and may contribute to a higher frequency of transformation by reducing the damage inflicted on the recipient cells by projectiles that are too large.

Agrobacterium-mediated transfer is another widely applicable system for introducing transgenes into plant cells. Modern *Agrobacterium* transformation vectors are capable of replication in *E. coli* as well known in the art. For example, U.S. Pat. No. 5,349,124 describes a method of transforming lettuce plant cells using *Agrobacterium*-mediated transformation. By inserting a chimeric gene having a DNA coding sequence encoding for the full-length B.t. toxin

protein that expresses a protein toxic toward Lepidopteran larvae, this methodology resulted in lettuce having resistance against such insects.

Transformation of plant protoplasts also can be achieved using methods based on calcium phosphate precipitation, polyethylene glycol treatment, electroporation, and combinations of these treatments (see, e.g., Neuhaus and Spangenberg, *Physiologia Plantarum* (1990) 79 (1): 213-217).

The foregoing methods for transformation would typically be used for producing a transgenic plant. The transgenic plant could then be crossed with another (non-transgenic or transgenic) plant in order to produce a new transgenic plant. Alternatively, a genetic trait that has been engineered into a particular lettuce plant using the foregoing transformation techniques could be moved into another plant using traditional breeding techniques that are well known in the plant breeding arts.

In another embodiment the invention relates to a method for producing lettuce seed, comprising crossing a plant of the invention with itself or a different lettuce plant and harvesting the resulting seed. In a further embodiment the invention relates to seed produced according to this method and/or a lettuce plant produced by growing such seed.

In still yet another aspect, the invention provides a method of determining the genotype of a plant of the invention comprising detecting in the genome of the plant at least a first polymorphism. The method may, in certain embodiments, comprise detecting a plurality of polymorphisms in the genome of the plant. For example, a sample of nucleic acid is obtained from a plant and a polymorphism or a plurality of polymorphisms is detected in said nucleic acids. The method may further comprise storing the results of the step of detecting the plurality of polymorphisms on a computer readable medium.

Molecular markers may also be used to aid in the identification of the plants containing both a desired trait and having recovered a high percentage of the recurrent parent's genetic complement. Selection of lettuce plants for breeding is not necessarily dependent on the phenotype of a plant and instead can be based on genetic investigations. For example, one can utilize a suitable genetic marker which is closely genetically linked to a trait of interest. One of these markers can be used to identify the presence or absence of a trait in the offspring of a particular cross, and can be used in selection of progeny for continued breeding. This technique is commonly referred to as marker assisted selection. Any other type of genetic marker or other assay that is able to identify the relative presence or absence of a trait of interest in a plant can also be useful for breeding purposes. Procedures for marker assisted selection applicable to the breeding of lettuce are well known in the art. Such methods will be of particular utility in the case of recessive traits and variable phenotypes, or where conventional assays may be more expensive, time consuming or otherwise disadvantageous. Types of genetic markers which could be used in accordance with the invention include, but are not necessarily limited to, Simple Sequence Length Polymorphisms (SSLPs), Simple Sequence Repeats (SSR), Randomly Amplified Polymorphic DNAs (RAPDs), DNA Amplification Fingerprinting (DAF), Sequence Characterized Amplified Regions (SCARs), Arbitrary Primed Polymerase Chain Reaction (AP-PCR), Amplified Fragment Length Polymorphisms (AFLPs), and Single Nucleotide Polymorphisms (SNPs).

Plant genetic complements may be assessed by genetic marker profiles, and by the expression of phenotypic traits that are characteristic of the expression of the genetic

complement, e.g., gene expression profiles, gene product expression profiles and isozyme typing profiles. It is understood that a plant of the invention or a first generation progeny thereof could be identified by any of the many well-known techniques such as, for example, Simple Sequence Length Polymorphisms (SSLPs), Randomly Amplified Polymorphic DNAs (RAPDs), DNA Amplification Fingerprinting (DAF), Sequence Characterized Amplified Regions (SCARs), Arbitrary Primed Polymerase Chain Reaction (AP-PCR), Amplified Fragment Length Polymorphisms (AFLPs) (see, e.g., EP 534 858), and Single Nucleotide Polymorphisms (SNPs).

Products and Package

Also provided are plant parts derived from variety NUN 09051, or from a vegetatively propagated plant of NUN 09051, being selected from the group consisting of: harvested (mature or immature) leaves or parts thereof, pollen, ovules, cells, heads, cotyledons, seeds or parts thereof, stalks or parts thereof, roots or parts thereof, cuttings, or parts thereof, flowers, florets, or flower buds.

In one embodiment, the invention provides for extracts of a plant described herein and compositions comprising or consisting of such extracts. In a preferred embodiment, the extract consists of or comprises tissue of a plant described herein or is obtained from such tissue. For example sesquiterpene-lactones such as lactucin, lactucid or lactucopicrin; or triterpenes such as amyirin, lactucic acid or taraxasterol cyanine may be an extract obtained from leaf tissue and used to make a health-beneficial composition (e.g., a pharmaceutical or nutraceutical composition).

The invention also provides for a food or feed product comprising or consisting of a plant part described herein and/or an extract from a plant part described herein. The food or feed product may be fresh or processed, e.g., canned, steamed, boiled, fried, blanched and/or frozen etc.

A lettuce plant designated NUN 09051, a progeny thereof, a derived variety thereof (such as EDV), and parts of the afore-mentioned plants/varieties can be suitably packed for, e.g., transport, and/or sold fresh. Such parts encompass any cells, tissues and organs obtainable from the seedlings or plants, such as but not limited to: heads, cuttings, pollen, leaves, parts of leaves, and the like. Heads and leaves may be harvested immature, as baby-leaf, or mature. A plant, plants or parts thereof may be packed in a container (e.g., bags, cartons, cans, etc.) alone or together with other plants or materials. Parts can be stored and/or processed further. Encompassed are therefore also food or feed products comprising one or more of such parts, such leaves or parts thereof obtainable from NUN 09051 plant, a progeny thereof a derived variety thereof (such as EDV), and parts of the afore-mentioned plants/varieties.

For example, containers such as cans, boxes, crates, bags, cartons, Modified Atmosphere Packagings, films (e.g. biodegradable films), etc. comprising plant parts of plants (fresh and/or processed) designated NUN 09051 are also provided herein.

Color

The "red color" of a plant in accordance with the present invention can be determined by comparing the color of, e.g., fourth or mature leaves with fourth or mature leaves of another plant such as a MULTY plant grown under the same conditions. The skilled person can, e.g., use a RHS color chart: 2007 as described herein.

Moreover, the concentration of anthocyanins can be determined by using standard methods known in the art. One of these methods is, e.g., described in US 2009/0106867. For example, a headed and mature lettuce plant is harvested and

outer leaves are taken off. In general the four oldest leaves can be regarded as outer leaves. The skilled person is aware that the oldest leaves of a lettuce plant are located at the outer part of the lettuce plant.

The leaves can be pulverized and analyzed for anthocyanins. Pulverization can be achieved by, e.g., freezing the leaves and grinding them with a sledgehammer and further grinding the crude powder with a knife mill such as a Grindomix GM 200 (Retsch, 5" 3000 rpm followed by 5" 5000 rpm) using the free floating lid in presence of liquid nitrogen to achieve a powder for analysis of anthocyanins.

As an example for the analysis, said powder is added to a solution of HCl in methanol (e.g. 1 M HCl in 50% methanol). The amount of sample depends from the color. Generally 2-40 ml/g sample is used. The used volume (ml) is noted. A part of the solution is freed from insoluble parts, e.g., by using a centrifuge at 4° C., 13000 rpm for around 4 min.

The spectrum of 360-900 nm is measured and the absorbance at 523 nm (if necessary after dilution with extraction liquid) and the maximum wavelength (λ_{max}) are determined. λ_{max} should be close to 523 nm.

Moreover, chlorophylls are measured by immediately adding 100% methanol to the test sample of the anthocyanin analysis. The volume (ml) used is noted.

The spectrum of 360-900 nm is measured and the absorbance at 665 nm (if necessary after dilution with extraction liquid) and the maximum wavelength (λ_{max}) determined. λ_{max} should be close to 665 nm.

The A523 and A665 are corrected to represent the absorbance of a solution of 1 g fresh weight in 10 ml extraction volume. The corrected A523 and A665 are calculated with a correction for weighted sample (in g), extraction volume (in ml) and if necessary dilution using the following formula:

$$A_{corrected} = \frac{A_{measured} * \text{extraction volume}}{\text{weight} * 10} * \text{dilution}$$

The ratio A523/A665 is calculated.

DEPOSIT INFORMATION

A total of 2500 seeds of the variety NUN 09051 were deposited by Nunhems B. V. on Jul. 29, 2015, at the NCIMB Ltd., Ferguson Building, Craibstone Estate, Bucksburn, Aberdeen AB21 9YA, United Kingdom (NCIMB). The deposit has been assigned Accession Number NCIMB 42446. A deposit of NUN 09051 and of the male and female parent line is also maintained at Nunhems B.V. Access to the deposit will be available during the pendency of this application to persons determined by the Director of the U.S. Patent Office to be entitled thereto upon request. Subject to 37 C.F.R. §1.808(b), all restrictions imposed by the depositor on the availability to the public of the deposited material will be irrevocably removed upon the granting of the patent. The deposit will be maintained for a period of 30 years, or 5 years after the most recent request or for the enforceable life of the patent whichever is longer, and will be replaced if it ever becomes nonviable during that period. Applicant does not waive any rights granted under this patent on this application or under the Plant Variety Protection Act (7 USC 2321 et seq.).

Various modifications and variations of the described products and methods of the invention will be apparent to those skilled in the art without departing from the scope and

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spirit of the invention. Although the invention has been described in connection with specific preferred embodiments, it should be understood that the invention as claimed should not be unduly limited to such specific embodiments. Indeed, various modifications of the described modes for carrying out the invention which are obvious to those skilled in plant breeding, chemistry, biology or related fields are intended to be within the scope of the following claims.

EXAMPLES

Development of NUN 09051

The variety NUN 09051 was developed from an initial cross between a lettuce variety and a breeding line. The female and male parents were crossed to produce hybrid (F₁) seeds. After the cross, F₁ plants were self pollinated. From the second to the fifth generation pedigree selection was performed. From the sixth to the ninth generation line selection was performed.

Variety NUN 09051 has been observed for at least three generations in different trials on different locations and during seed increase and is uniform and stable.

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The variety is, therefore, uniform and genetically stable. This has been established through evaluation of horticultural characteristics. Independent seed production events resulted in no observable deviation in genetic stability.

The seeds of NUN 09051 can be grown to produce plants and parts thereof (e.g. heads or leaves). The variety NUN 09051 can be propagated by seeds or vegetative propagation.

NUN 09051 characteristics were compared with those of MULTY and GRAND RAPIDS according to standards of the U.S. Department of Agriculture, Agricultural Marketing Service, Science and Technology, Plant Variety Protection Office, Beltsville, Md. 20705. Trials were carried out by Nunhems USA Inc., e.g., in Acampo, Calif. (US) in 2012 (Sow date: Jan. 31, 2012), Salinas (Mar. 9, 2011, duration 50 days), King City (Sow date: Apr. 13, 2011, duration 45 days), Hollister (Sow date: Jul. 26, 2011, duration 45 days) and Yuma, Ariz. (US) (Sow date: Nov. 15, 2011, duration 55 days).

Characteristics of NUN 09051

Table 1 shows the USDA descriptors of NUN 09051 (this application), MULTY and GRAND RAPIDS of a field trial in Acampo, Calif., US. 20 plants or plant parts were randomly selected from two replications of 100 plants each of a field trial in Acampo. These 20 plants were used to measure characteristics. The values are mean values.

TABLE 1

USDA number	USDA descriptor	NUN 09051	MULTY	GRAND RAPIDS
1	Plant type 1 = Cutting/Leaf	1	1	1
2	Seed			
	Color 1 = white (silver grey), 2 = black (grey brown), 3 = brown (amber)	1	1 + 2	1 + 2
	Light Dormancy 1 = light required, 2 = light not required	2	2	2
	Heat Dormancy 1 = susceptible, 2 = not susceptible	2	2	1
3	Cotyledon to fourth leaf stage			
	Shape of Cotyledons 1 = broad, 2 = intermediate, 3 = spatulate	2	2	1
	Shape of fourth leaf 3 = oval, 6 = pinnately lobed	6	6	3
	Length/Width index of fourth leaf: (L/W × 10)	16.8	8.7	11.0
	Apical margin 1 = entire, 2 = crenate/gnawed, 3 = finely dentate, 4 = moderately dentate, 5 = coarsely dentate, 6 = incised, 7 = lobed, 8 = other (undulate)	5	6	1
	Basal margin 1 = entire, 2 = crenate/gnawed, 3 = finely dentate, 4 = moderately dentate, 5 = coarsely dentate, 6 = incised, 7 = lobed, 8 = other (undulate)	5	6	5
	Undulation 1 = flat, 2 = slight, 3 = medium, 4 = marked	2	3	2
	Green color 1 = yellow green, 2 = light green, 3 = medium green, 4 = dark green	2	3	1
	Anthocyanin:			
	Distribution 1 = absent, 2 = margin only, 3 = spotted, 4 = throughout 5 = other (specify: leaf excluding petiole/rib)	5	1	1
	Concentration 1 = light, 2 = moderate, 3 = intense	3	—	—

TABLE 1-continued

USDA number	USDA descriptor	NUN 09051	MULTY	GRAND RAPIDS
4	Rolling 1 = absent, 2 = present	1	1	1
	Cupping 1 = uncupped, 2 = slight, 3 = markedly	1	1	2
	Reflexing 2 = apical margin, 3 = lateral margins	1	1	1
	Mature leaves (harvest mature outer leaves): Margin:			
	Incision depth (deepest penetration of the margin) 1 = absent/shallow (Dark Green Boston), 2 = moderate (Vanguard), 3 = deep (Great Lakes 659)	3	3	2
	Indentation (finest divisions of the margin) 1 = entire, 2 = shallowly dentate (Great Lake 65), 3 = deeply dentate (Great Lake 659)	3	3	2
	Undulations of the apical margin 1 = absent/slight (Dark Green Boston), 2 = moderate (Vanguard), 3 = strong (Great Lakes 659)	3	3	3
	Green color 1 = very light green, 2 = light green, 3 = medium green, 4 = dark green, 6 = other Anthocyanin:	not recorded	4	2
	Distribution 1 = absent, 3 = spotted (California Cream Butter), 4 = throughout (Prize Head)	4	1	1
	Concentration 1 = light, 2 = moderate, 3 = intense	3	—	—
	Size 1 = small, 2 = medium, 3 = large	1	1	2
	Glossiness 1 = dull, 2 = moderate, 3 = glossy	1	1	2
	Blistering 1 = absent/slight, 2 = moderate, 3 = strong	1	1	2
	Leaf thickness 1 = thin, 2 = intermediate, 3 = thick	1	1	2
5	Trichomes; 1 = absent, 2 = present	1	1	1
	Plant			
	Spread of frame leaves	17 cm	29 cm	36 cm
	Head diameter (market trimmed with single cap leaf)	— cm	— cm	— cm
	Head shape 1 = flattened, 2 = slightly flattened, 4 = elongate, 5 = non-heading	5	5	5
	Head size class 1 = small, 2 = medium, 3 = large	1	2	3
	Head per carton	—	—	—
	Head weight	60.7 g	255.9 g	532.3 g
	Head firmness 1 = loose, 3 = Firm, 4 = very firm	1	1	1
	Butt			
6	Shape 1 = slightly concave, 2 = flat, 3 = rounded	2	2	2
	Midrib 1 = flattened; 2 = moderately raised; 3 = prominently raised	1	1	2
	Core			
7	Diameter at base of head	5 mm	15.5 mm	16.9 mm
	Ratio of Frame Head Spread/Core diameter	3.4	1.9	2.1
8	Core height from base of head to apex	7.6 mm	14.6 mm	19.5 mm
	Bolting (first water date: Jun. 15, 2012)			
	Number of days from first water date to seed stalk emergence (note: First water date is the date seed first receives adequate moisture to germinate. This often equals planting date).	120	77	66
	Bolting class 1 = very low, 3 = medium, 4 = rapid, 5 = very rapid	1	3	4
	Height of mature seed stalk	47.3 cm	102 cm	108 cm
	Spread of bolter plant (at widest point)	24 cm	21 cm	29 cm
	Bolter Leaves 1 = straight; 2 = curved	1	1	1
	Margin 1 = entire; 2 = dentate	2	2	2

TABLE 1-continued

USDA number	USDA descriptor	NUN 09051	MULTY	GRAND RAPIDS
	Color 1 = light green, 2 = medium green, 3 = dark green, 4 = purple Bolter Habit:	4	3	1
	Terminal Inflorescence 1 = absent, 2 = present	1	1	1
	Lateral shoots 1 = absent, 2 = present	1	2	2
	Basal side shoots 1 = absent, 2 = present	1	2	2
9	Maturity (earliness of harvest-mature head formation)	62 days (spring)	62 days (spring)	70 days (spring)
10	Adaptation:	—	—	—
	Primary regions of adaptation:	West Coast		
	Season	Fall (2),		—
	0 = not tested, 1 = not adapted, 2 = adapted	Winter (2), Spring (2), Summer (2)		
	Greenhouse	0	—	—
	0 = not tested, 1 = not adapted, 2 = adapted			
	Soil type	3	—	—
	1 = mineral, 2 = organic, 3 = both			

— = not measured

These are typical values. Values may vary due to environment. Other values that are substantially equivalent are also within the scope of the invention.

Without limiting the scope of the present invention, FIG. 1 shows the different shape of mature leaves of NUN 09051 and mature leaves of MULTY. The Figures may also be available as colored pictures on request.

The invention claimed is:

1. A lettuce plant, designated NUN 09051, or part thereof, a representative sample of seeds of which having been deposited under Accession Number NCIMB 42446.

2. A seed designated NUN 09051, a representative sample of seeds having been deposited under Accession Number NCIMB 42446.

3. A plant, or a part thereof, produced by growing the seed of claim 2.

4. A part of the plant of claim 1, wherein the part is a head or a leaf or a part thereof.

5. A cell culture or tissue culture of the lettuce plant of claim 1.

6. A lettuce plant which is regenerated from the part of the plant of claim 1 and comprises essentially all the physiological and morphological characteristics of NUN 09051, a representative sample of seeds of which having been deposited under Accession Number NCIMB 42446.

7. A lettuce plant which is regenerated from the cell culture or tissue culture of claim 5 and comprises essentially all the physiological and morphological characteristics of NUN 09051, a representative sample of seeds of which having been deposited under Accession Number NCIMB 42446.

8. A progeny plant of lettuce variety designated NUN 09051, a representative sample of seeds of which having been deposited under Accession Number NCIMB 42446, obtained by further breeding with said variety, wherein said progeny plant has essentially all the physiological and morphological characteristics of the variety designated NUN 09051 when grown under the same environmental conditions.

9. A method for producing lettuce seed, comprising crossing the plant of claim 1 or 3 with itself or a different lettuce plant and harvesting the resulting seed.

10. A seed produced by the method of claim 9.

11. A lettuce plant produced by growing the seed of claim 10.

12. An Essentially Derived Variety of NUN 09051 having one, two or three physiological and/or morphological characteristics which are different from those of NUN 09051 and which otherwise has essentially all the physiological and morphological characteristics of a lettuce plant designated NUN 09051, a representative sample of seeds of which having been deposited under Accession Number NCIMB 42446.

13. An Essentially Derived Variety of NUN 09051 according to claim 12 having one or two physiological and/or morphological characteristics which are different from those of NUN 09051 and has essentially all the physiological and morphological characteristics of a lettuce plant designated NUN 09051 obtainable by selecting a natural or induced mutant, or a somaclonal variant from a population of plants designated NUN 09051, a representative sample of seeds of which having been deposited under Accession Number NCIMB 42446.

14. A package comprising a head, leaves or parts thereof of the plant of claim 1 or 3.

15. A package comprising the seed of claim 2.

16. A seed pellet comprising the seed of claim 2.

17. A method of producing a lettuce plant, comprising crossing the plant of claim 1 or claim 3 with a second lettuce plant one or more times and/or selfing the plant of claim 1 or 3 one or more times, and selecting progeny from said crossing and/or selfing.

18. A method of producing a lettuce plant derived from NUN 09051 comprising the steps of:

(a) preparing a progeny plant derived from NUN 09051 by crossing the plant of claim 1 with itself or with a second lettuce plant, a representative sample of seeds of NUN 09051 having been deposited under Accession Number NCIMB 42446;

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- (b) crossing the progeny plant with itself or a second lettuce plant to produce a seed of a progeny plant of a subsequent generation; and optionally
- (c) growing a progeny plant of a subsequent generation from said seed and crossing the progeny plant of a subsequent generation with itself or a second lettuce plant; and optionally
- (d) repeating step b) and/or c) for at least 1 more generation to produce a lettuce plant derived from NUN 09051.

19. A method of producing a hybrid lettuce seed, comprising crossing a first parent lettuce plant with a second parent lettuce plant and harvesting the resultant hybrid lettuce seed, wherein said first parent lettuce plant or said second parent lettuce plant is a lettuce plant of claim 1.

20. A hybrid lettuce seed produced by crossing a first parent lettuce plant with a second parent lettuce plant and harvesting the resultant hybrid lettuce seed, wherein said first parent lettuce plant or said second parent lettuce plant is a lettuce plant of claim 1.

21. A method of introducing a single locus conversion into a lettuce plant designated NUN 09051 a representative sample of seeds of which having been deposited under Accession Number NCIMB 42446, comprising:

- (a) crossing a plant designated NUN 09051 with a second plant comprising a desired single locus to produce a F_1 progeny plant;
- (b) optionally selfing said F_1 progeny plant to produce a F_2 progeny plant having said single locus;
- (c) crossing said F_1 or F_2 progeny plant of step (a) or step (b), respectively, with a plant of NUN 09051 to produce backcross progeny plants;
- (d) selecting backcross progeny plants that have the single locus and otherwise essentially all the physiological and morphological characteristics of a plant designated NUN 09051; and optionally

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- (e) repeating steps (c) and (d) one or more times in succession to produce selected second or higher backcross progeny plants that comprise the single locus and otherwise comprise essentially all the physiological and morphological characteristics of a plant designated NUN 09051 when grown under the same environmental conditions.

22. The method of claim 21, wherein the single locus confers a trait, wherein the trait is pest resistance or disease resistance.

23. The method of claim 21, wherein the single locus confers at least one trait, wherein said trait is at least one trait selected from the group consisting of resistance against *Nasonovia ribisnigri* Nr: 1 or Nr: 0, downy mildew, *Sclerotinia* rot, *Botrytis*, powdery mildew, anthracnose, bottom rot, corky root rot, lettuce mosaic virus, big vein, lettuce aphid, beet western yellows and aster yellows, *Sclerotinia minor* (leaf drop), *Sclerotinia sclerotiorum* (leaf drop), *Rhizoctonia solani* (bottom drop), *Erysiphe cichoracearum* (powdery mildew), *Fusarium oxysporum* f. sp. *Lactucae* (*fusarium* wilt), lettuce infectious yellows virus (LIYV), lettuce mosaic virus (LMV), Cucumber mosaic virus (CMV), Beet western yellows virus (BWYV), Alfalfa mosaic virus (AMV), nematodes and herbicides.

24. A plant of claim 1 wherein said plant has at least the essential physiological and morphological characteristics of the variety designated NUN 09051 and further comprises at least one transgene that confers a desired trait.

25. A method of determining the genotype of the plant of claim 1 comprising obtaining a sample of nucleic acids from said plant and detecting in said nucleic acids a plurality of polymorphisms.

26. The method of claim 25, further comprising the step of storing the results of detecting the plurality of polymorphisms on a computer readable medium.

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